



### DATA BOOK CONTENTS:

- SHORT-FORM CATALOG
- FIRST-PAGE DATA SHEETS
- SALES OFFICES

### CD ROM CONTENTS:

- COMPLETE DATA SHEETS  
AND APPLICATION NOTES  
FOR ALL PRODUCTS
- USER'S GUIDES



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For the latest information about every product we make, visit our World Wide Web site. You'll find the most complete, up-to-date information about our products available seven days a week, 24 hours a day. Here's just some of what you'll find:

- Complete Data Sheets for All Dallas Semiconductor Products
- Application Notes
- New Product Announcements
- Technical Support
- Overviews of All Product Families
- Up-to-Date List of World-Wide Sales Offices
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Dallas Semiconductor™	Touch Thermometer™	Touch Time™	Touch Meter™
DST™	Memory Button™	Authorization Button™	Micro Monitor™
Dallastat	Touch Memory Probe™	Touch Pen™	Cyber Card™
Stick'Em Chip™	Certified Dallas Touch™	Time Button™	Cyber Key™
Button Holder™	UniqueWare™	Button Ready PCTM	Soft Microcontroller™
Touch Memory EXecutive™	Dallas Registered™	MicroLan™	Secure Microcontroller™
TMEX™	Button™	ID Button™	Soft Silicon™
MultiButton™	Dallas Personal SignOn™	Dallas Protected Software™	iButton™
Touch Memory Button™	Dallas SignOn™	Load & Lock™	All device numbers

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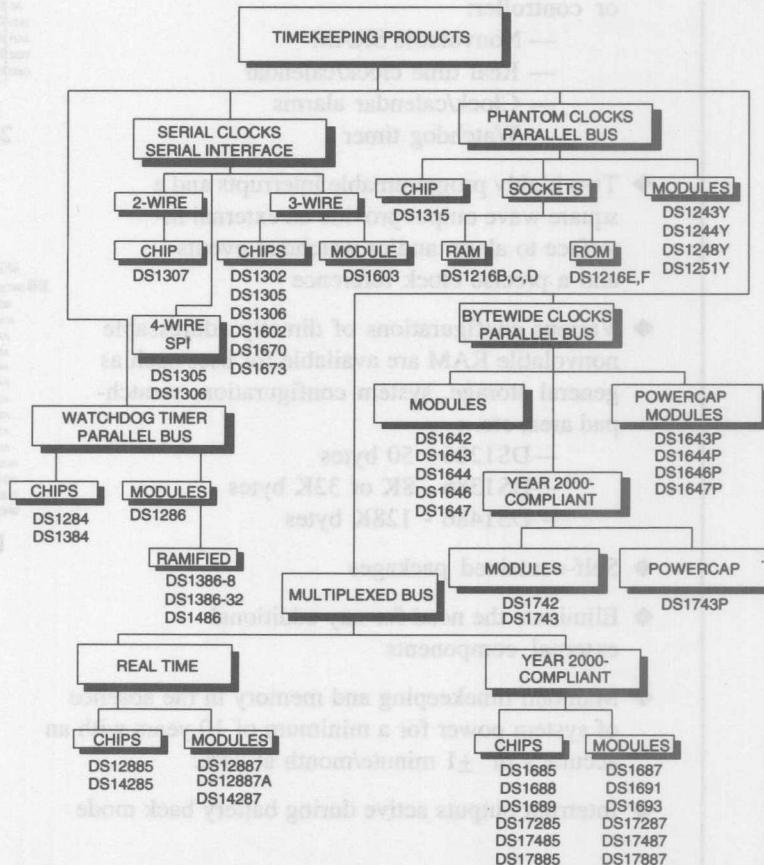
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# Timekeeping

Dallas Semiconductor has been the leader in providing Real Time Clocks for a broad range of applications since 1985. The company's proprietary timekeeping CMOS circuits consume current at the nano-ampere level during periods of inactivity. As a result, they can be powered by a lithium cell for more than 10 years, longer than the useful life of most equipment. Because of this longevity, equipment manufacturers do not have to design provisions for battery replacement into their products. In addition to modules that combine circuits with lithium and quartz, Dallas Semiconductor offers timekeeping chips.



## Applications

- ◆ Computers
- ◆ Data communication systems
- ◆ Medical equipment
- ◆ Cellular phones
- ◆ Fax machines
- ◆ Industrial controllers
- ◆ Security systems
- ◆ Hand-held GPS receivers

# Featured Products

## Watchdog Timekeeping Modules

Various configurations of directly addressable nonvolatile RAM are available.

- ◆ Provide four functions for a processor or controller:
  - Nonvolatile SRAM
  - Real time clock/calendar
  - Clock/calendar alarms
  - Watchdog timer
- ◆ Two highly programmable interrupts and a square wave output provide an external interface to alarm and/or watchdog events and a precise clock reference
- ◆ Various configurations of directly addressable nonvolatile RAM are available for uses such as general storage, system configuration, scratchpad area, etc.
  - DS1286 - 50 bytes
  - DS1386 - 8K or 32K bytes
  - DS1486 - 128K bytes
- ◆ Self-contained packages
- ◆ Eliminate the need for any additional external components
- ◆ Maintain timekeeping and memory in the absence of system power for a minimum of 10 years with an accuracy of  $\pm 1$  minute/month at 25°C
- ◆ Interrupt outputs active during battery back mode

INTA	1	28	V <sub>CC</sub>	32	V <sub>CC</sub>
NC	2	27	WE	31	SQW
NC	3	26	INTB (INTB)	30	V <sub>CC</sub>
NC	4	25	NC	29	WE
A5	5	24	NC	28	NC
A4	6	23	SQW	27	A8
A3	7	22	OE	26	A9
A2	8	21	NC	25	A11
A1	9	20	CE	24	OE
A0	10	19	DQ7	23	A10
DQ0	11	18	DQ6	22	CE
DQ1	12	17	DQ5	21	DQ7
DQ2	13	16	DQ4	20	DQ6
DQ3	14	15	DQ3	19	DQ5
GND	15			18	DQ4
GND	16			17	DQ3

**DS1286**  
28-pin DIP  
Module

**DS1386-8**  
32-pin DIP  
Module

INTA	1	32	V <sub>CC</sub>	32	V <sub>CC</sub>
INTB (INTB)	2	31	SQW	31	A15
NC	3	30	V <sub>CC</sub>	30	INTA/SQW
A12	4	29	WE	29	WE
A7	5	28	A13	28	A13
A6	6	27	A8	27	A8
A5	7	26	A9	26	A9
A4	8	25	A11	25	A11
A3	9	24	OE	24	OE
A2	10	23	A10	23	A10
A1	11	22	CE	22	CE
A0	12	21	DQ7	21	DQ7
DQ0	13	20	DQ6	20	DQ6
DQ1	14	19	DQ5	19	DQ5
DQ2	15	18	DQ4	18	DQ4
GND	16	17	DQ3	17	DQ3

**DS1386-32**  
32-pin DIP  
Module

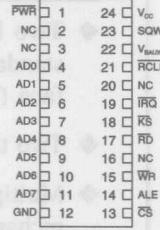
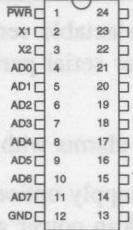
**DS1486**  
32-pin DIP  
Module

# Featured Products

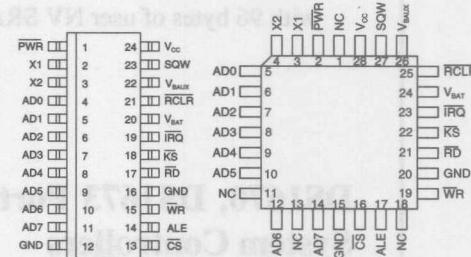
## 3V/5V Multiplexed Bus Real Time Clocks

These clocks incorporate the industry-standard DS1285/DS1287 clock plus additional features.

- ◆ Year 2000-compliant
- ◆ 64-bit silicon serial number
- ◆ 114 bytes of user RAM
- ◆ Additional extended general-purpose RAM:
  - 128 bytes (DS1685, DS1687)
  - 2K bytes (DS17285, DS17287)
  - 4K bytes (DS17485, DS17487)
  - 8K bytes (DS17885, DS17887)
- ◆ Burst mode feature available when accessing the extended RAM (DS17x8x devices only)
- ◆ Century counter and date alarm
- ◆ Power control circuitry supports system power-on from a date/time alarm or a key closure
- ◆ +3V or +5V operation
- ◆ Available as chip (DS1685, DS17285, DS17485, DS17885) or standalone module with embedded battery and 32.768 kHz crystal (DS1687, DS17287, DS17487, DS17887)
- ◆ Provide an easy upgrade path for systems requiring more memory without any hardware modifications
- ◆ Pin configuration closely matches the DS12885/DS12887
- ◆ Output a 32 kHz square wave signal each time system power is applied and are ideal devices for systems with processors requiring a clock at power-up



24-pin SOIC  
(24-pin TSSOP  
DS1685 Only)



24-pin DIP

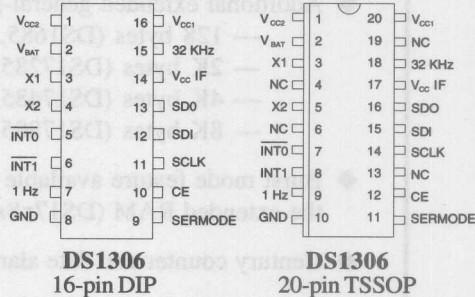
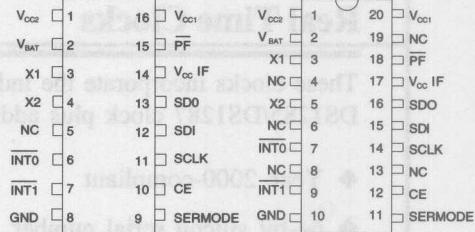


28-pin PLCC

# Featured Products

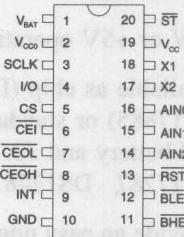
## DS1305, DS1306 Serial Alarm Time Chips

- ◆ Two hardware-selectable serial interfaces: standard 3-wire or serial peripheral interface (SPI)
- ◆ Two time-of-day alarms with interrupt outputs
- ◆ Multiple power supply options supporting rechargeable backup power sources
- ◆ Interface logic power supply input for mixed 3V/5V supply system capability
- ◆ 2.0V to 5.5V operation
- ◆ Standard clock/calendar functions along with 96 bytes of user NV SRAM



## DS1670, DS1673 Portable System Controllers

- ◆ Low-power, highly integrated devices ideal for hand-held portable products
- ◆ Standard clock/calendar function with standard 3-wire interface
- ◆ CPU monitor functions including power-on reset and watchdog timer
- ◆ Contain a 3-channel multiplexed 8-bit A/D converter with 10ms conversion time
- ◆ Time-of-day alarm with interrupt output
- ◆ Perform nonvolatile backup control to external SRAM
- ◆ 3.0V, 3.3V, and 5.0V operation



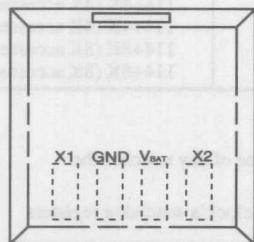
**DS1670, DS1673**  
20-pin TSSOP  
20-pin SOIC

# Featured Products

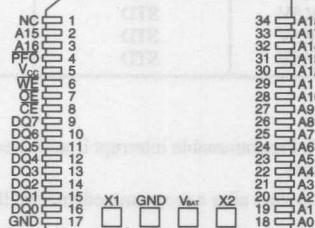
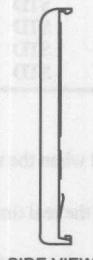
These Timekeeping RAM Modules provide identical functions and performance to their dual-in-line packaged counterparts. The PowerCap is a PLCC package which provides a surface mount option to the NV Timekeeping RAM product family.

## NV Timekeeping RAM PowerCaps

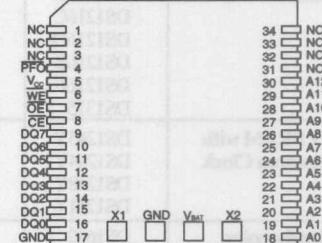
- ◆ Integrate a real time clock function with various configurations of nonvolatile SRAM
- ◆ Self-contained packages include NV SRAM, real time clock, and power control circuit
- ◆ Directly addressable bytewide RAM and BCD formatted timekeeping registers
- ◆ Allow for a simple hardware/software device interface design
- ◆ Require DS9034PCX



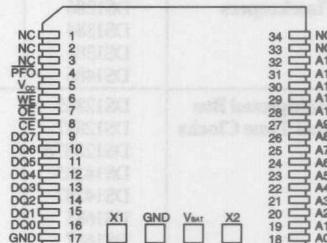
**DS9034PCX**  
PowerCap with Crystal



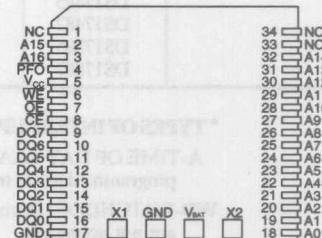
**DS1647P**  
34-pin PowerCap Module Board  
(Uses DS9034PCX PowerCap)



**DS1643P**  
34-pin PowerCap Module Board  
(Uses DS9034PCX PowerCap)



**DS1644P**  
34-pin PowerCap Module Board  
(Uses DS9034PCX PowerCap)



**DS1646P**  
34-pin PowerCap Module Board  
(Uses DS9034PCX PowerCap)

# Selection Table

	Device Number	Power Options	Clock Format <sup>1,2</sup>	Calendar Format	User RAM (Bytes)
Serial Clocks	DS1302	2V-5V	STD	STD	31
	DS1305	2V-5V	STD	STD	96
	DS1306	2V-5V	STD	STD	96
	DS1307	5V	STD	STD	56
	DS1602	5V	BINARY	BINARY	
	DS1603	5V	BINARY	BINARY	
	DS1670	3.3V	STD	STD	
	DS1673	3.0V,5V	STD	STD	
Phantom	DS1216B	5V	STD+hh	STD	2K, 8K <sup>†</sup>
	DS1216C	5V	STD+hh	STD	8K, 32K <sup>†</sup>
	DS1216D	5V	STD+hh	STD	8K, 32K, 128K, 512K <sup>†</sup>
	DS1216E	5V	STD+hh	STD	ROM: 8K, 32K <sup>†</sup>
	DS1216F	5V	STD+hh	STD	ROM: 8K, 32K, 128K <sup>†</sup>
	DS1315	3.3V,5V	STD+hh	STD	
NV SRAM with Phantom Clock	DS1243Y	5V	STD+hh	STD	8K
	DS1244Y	5V	STD+hh	STD	32K
	DS1248Y	5V	STD+hh	STD	128K
	DS1251Y	5V	STD+hh	STD	512K
Timekeeping NV RAM	DS1642	5V	STD	STD	2K
	DS1643	5V	STD	STD	8K
	DS1644	5V	STD	STD	32K
	DS1646	5V	STD	STD	128K
	DS1647	5V	STD	STD	512K
	DS1742	3.3V,5V	STD	STD	2K
	DS1743	3.3V,5V	STD	STD	8K
Watchdog Timekeepers	DS1284	5V	STD+hh	STD	50
	DS1286	5V	STD+hh	STD	50
	DS1384	5V	STD+hh	STD	50
	DS1386	5V	STD+hh	STD	8K, 32K
	DS1486	5V	STD+hh	STD	128K
Multiplexed Bus Real Time Clocks	DS12885	5V	STD	STD	114
	DS12887	5V	STD	STD	114
	DS12887A	5V	STD	STD	114
	DS14285	5V	STD	STD	114
	DS14287	5V	STD	STD	114
	DS1685	3V,5V	STD	STD	114+128 (128 accessed via SW control)
	DS1687	3V,5V	STD	STD	114+128 (128 accessed via SW control)
	DS1688	3V,5V	STD	STD	114
	DS1689	3V,5V	STD	STD	114
	DS1691	3V,5V	STD	STD	114
	DS1693	3V,5V	STD	STD	114
	DS17285	3V,5V	STD	STD	114+2K (2K accessed via SW control)
	DS17287	3V,5V	STD	STD	114+2K (2K accessed via SW control)
	DS17485	3V,5V	STD	STD	114+4K (4K accessed via SW control)
	DS17487	3V,5V	STD	STD	114+4K (4K accessed via SW control)
	DS17885	3V,5V	STD	STD	114+8K (8K accessed via SW control)
	DS17887	3V,5V	STD	STD	114+8K (8K accessed via SW control)

**\* TYPES OF INTERRUPTS:**

**A-TIME OF DAY ALARM:** Programmable interrupt is activated when the time of day matches the programmed alarm registers.

**WD-WATCHDOG:** Interrupt occurs after a programmed interval if the real time clock's watchdog registers are not accessed.

**WU-WAKE-UP:** An internal alarm designed to wake up the system at a specified time/date.

**KS-KICKSTART:** An external signal to the real time clock causes an interrupt output which turns on the system power supply.

## **Selection Table**

**P-PERIODIC:** Programmable period interrupt which occurs from 500  $\mu$ s to 122  $\mu$ s.

**U-UPDATE IN PROGRESS:** Allows the user to determine if the real time clock is ready to perform.

**RC-RAM CLEAR:** A RAM clear interrupt is generated when the real time clock has completed a RAM clear operation.

**CR-CENTURY REGISTER:** The century register is automatically updated at the turn of the century.

**RESET**-Reset activated when an out-of-tolerance  $V_{cc}$  condition is detected.

<sup>†</sup> DS1216s will accept ROM or static RAM of sizes indicated.

#### **Notes:**

1. STD (HH:MM:SS; HH-Hours, MM-Minutes, SS-Seconds)
  2. STD+hh (HH:MM:SS; HH-Hours, MM-Minutes, SS-Seconds) hh-hundredths

# Memory Products

The centerpiece of the Memory Products family is our broad portfolio of Nonvolatile SRAM modules. Built using low-power SRAM, nonvolatile memory controllers and lithium batteries, these modules offer nonvolatile storage that can be read and written an unlimited number of times, at SRAM speeds, without wearing out. Capable of more than 10 years of battery-backed data retention, these products are truly ideal memories.

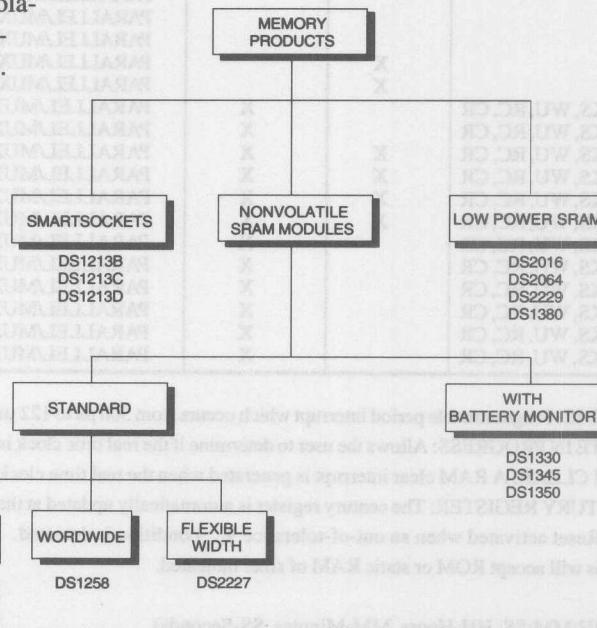
Dallas' new enhanced NV SRAM modules are the first battery-backed SRAMs in the industry with the built-in ability to monitor their own batteries and issue a warning before those batteries reach end-of-life. These modules also monitor system power and provide a warning when power goes out of tolerance.

Both standard and enhanced NV SRAMs are available in Dallas' new PowerCap™ module package. This innovative NV SRAM packaging system consists of two parts: a surface-mountable module base and a snap-on PowerCap. The module base is reflow-soldered to the host board while the PowerCap is stored elsewhere to protect its internal battery from the heat of reflow. Later the PowerCap is snapped onto the module base to form a complete NV SRAM module.

SmartSockets contain the nonvolatile memory controller and backup batteries needed to nonvolatile standard bytewidth SRAM components. An SRAM inserted into a SmartSocket is a complete nonvolatile memory, identical in functionality to an NV SRAM module.

Our low-power SRAMs are the same memories we use in our own NV SRAM modules.

Plugged into our SmartSockets or by themselves, these products are the world's best SRAMs for battery-backed memory applications because they require only nanoamps of data retention current.

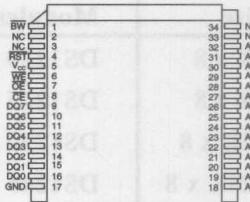


Most Nonvolatile SRAM modules are also available in 3.3-volt versions.

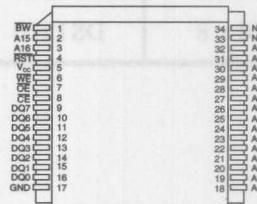
# Featured Products

## DS13xx Nonvolatile SRAM with Battery Monitor

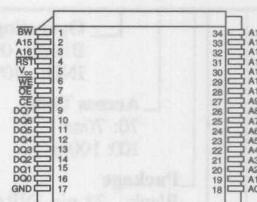
- ◆ Standard nonvolatile SRAM performance characteristics:
  - More than 10 years of data retention
  - Data automatically protected during power cycling
  - Read and write access times as fast as 70ns
- ◆ Sophisticated battery monitor checks remaining capacity once per day and activates Battery Warning output when battery is nearing end of life
- ◆ CPU reset function holds system in reset when power supply goes out of tolerance and also serves as a power-on reset
- ◆ Directly surface-mountable PowerCap module package protects battery from reflow heat
- ◆ Compatible pinouts make designing for multiple memory sizes easy
- ◆ Optional industrial temperature range available



**DS1330**  
**32K x 8**  
34-pin PowerCap Module



**DS1345**  
**128K x 8**  
34-pin PowerCap Module



**DS1350**  
**512K x 8**  
34-pin PowerCap Module

# Selection Tables

Memory Size	Standard Modules	Enhanced Modules
2K x 8	DS1220	
8K x 8	DS1225	
32K x 8	DS1230	DS1330
128K x 8	DS1245	DS1345
256K x 8	DS1249	
512K x 8	DS1250	DS1350
1M x 8	DS1265	
2M x 8	DS1270	

DS12XXTTP-SSS-III		STANDARD MODULE
		Operating Temperature Blank: 0°C to 70°C IND: -40°C to +85°C
		Access Time 100, 120, 150, or 200ns (DS1220) 85, 150, or 200ns (DS1225)
		Package Blank: 24-pin DIP (DS1220) 28-pin DIP (DS1225)
		Vcc Tolerance AB: ±5% AD: ±10% Y: ±10%
		Device DS1220: 2K x 8 DS1225: 8K x 8

DS12XXTTP-SSS-III		STANDARD MODULE
		Operating Temperature Blank: 0°C to 70°C IND: -40°C to +85°C
		Access Time 70: 70ns 100: 100ns
		Package Blank: 28-pin DIP (DS1230) 32-pin DIP (DS1245, DS1250) 36-pin DIP (DS1265, DS1270) 40-pin DIP (DS1258) P: 34-pin PowerCap Module
		Vcc Tolerance AB: ±5% Y: ±10%
		Device DS1230: 32K x 8 DS1245: 128K x 8 DS1249: 256K x 8 DS1250: 512K x 8 DS1258: 128K x 16 DS1265: 1M x 8 DS1270: 2M x 8

DS13XXTTP-SSS-III		ENHANCED MODULE
		Operating Temperature Blank: 0°C to 70°C IND: -40°C to +85°C
		Access Time 70: 70ns 100: 100ns
		Package P: 34-pin PowerCap Module
		Vcc Tolerance AB: ±5% Y: ±10%
		Device DS1330: 32K x 8 DS1345: 128K x 8 DS1350: 512K x 8

# Selection Tables

## SmartSockets

Number	Supports 2K x 8 SRAM	Supports 8K x 8 SRAM	Supports 32K x 8 SRAM	Supports 128K x 8 SRAM	Supports 512K x 8 SRAM	DIP Pin Count
DS1213B	X	X				28
DS1213C			X			28
DS1213D				X	X*	32

\*With user modification. See Application Note 4 in the CD ROM Databook or [www.dalsemi.com](http://www.dalsemi.com).

## Low-Power SRAM

Part Number	Density	Temperature	5-Volt Speed	3-Volt Speed	Package
DS2016-100	2K x 8	-40°C to +85°C	100ns	250ns	24-pin DIP
DS2016S-100	2K x 8	-40°C to +85°C	100ns	250ns	24-pin SOIC
DS2016-150	2K x 8	-40°C to +85°C	150ns	250ns	24-pin DIP
DS2016S-150	2K x 8	-40°C to +85°C	150ns	250ns	24-pin SOIC
DS2064-200	8K x 8	-40°C to +85°C	200ns	n/a	28-pin DIP
DS2064S-200	8K x 8	-40°C to +85°C	200ns	n/a	28-pin SOIC
DS2229-85	512Kx16	0°C to +70°C	85ns	n/a	80-pin SIP Stik

# Cross Reference

## Nonvolatile SRAM Modules

Benchmark Part Number	Memory Density	DS Standard Modules
bq4010MA-XXX	8K x 8	DS1225AB-XXX
bq4010MA-XXXXN	8K x 8	DS1225AB-XXX-IND
bq4010YMA-XXX	8K x 8	DS1225AD-XXX
bq4010YMA-XXXXN	8K x 8	DS1225AD-XXX-IND
bq4011MA-XXX	32K x 8	DS1230AB-XXX
bq4011MA-XXXXN	32K x 8	DS1230AB-XXX-IND
bq4011YMA-XXX	32K x 8	DS1230Y-XXX
bq4011YMA-XXXXN	32K x 8	DS1230Y-XXX-IND
bq4013MA-XXX	128K x 8	DS1245AB-XXX
bq4013MA-XXXXN	128K x 8	DS1245AB-XXX-IND
bq4013YMA-XXX	128K x 8	DS1245Y-XXX
bq4013YMA-XXXXN	128K x 8	DS1245Y-XXX-IND
bq4014MB-XXX	256K x 8	DS1249AB-XXX
bq4014YMB-XXX	256K x 8	DS1249Y-XXX
bq4015MA-XXX	512K x 8	DS1250AB-XXX
bq4015YMA-XXX	512K x 8	DS1250Y-XXX
bq4016MC-XXX	1M x 8	DS1265AB-XXX
bq4016YMC-XXX	1M x 8	DS1265Y-XXX
bq4017MC-XXX	2M x 8	DS1270AB-XXX
bq4017YMC-XXX	2M x 8	DS1270Y-XXX
bq4024MA-XXX	128K x 16	DS1258AB-XXX
bq4024YMA-XXX	128K x 16	DS1258Y-XXX

SGS-Thomson Part Number	Memory Density	DS Standard Modules
M48Z02-XXXPC1	2K x 8	DS1220AB-XXX
M48Z02-XXXPC6	2K x 8	DS1220AB-XXX-IND
M48Z12-XXXPC1	2K x 8	DS1220AD-XXX
M48Z12-XXXPC6	2K x 8	DS1220AD-XXX-IND
M48Z08-XXXPC1	8K x 8	DS1225AB-XXX
M48Z18-XXXPC1	8K x 8	DS1225AD-XXX
M48Z18-XXXPC6	8K x 8	DS1225AD-XXX-IND
M48Z58-XXXPC1	8K x 8	DS1225AB-XXX
M48Z58Y-XXXPC1	8K x 8	DS1225AD-XXX
M48Z30-XXXPM1	32K x 8	DS1230AB-XXX
M48Z30Y-XXXPM1	32K x 8	DS1230Y-XXX
M48Z32-XXXPC1	32K x 8	DS1230AB-XXX
M48Z32Y-XXXPC1	32K x 8	DS1230Y-XXX
M48Z35-XXXPC1	32K x 8	DS1230AB-XXX
M48Z35Y-XXXPC1	32K x 8	DS1230Y-XXX
M48Z128-XXXPM1	128K x 8	DS1245AB-XXX
M48Z128Y-XXXPM1	128K x 8	DS1245Y-XXX
M48Z256-XXXPL1	256K x 8	DS1249AB-XXX
M48Z256Y-XXXPL1	256K x 8	DS1249Y-XXX
M48Z512-XXXPM1	512K x 8	DS1250AB-XXX
M48Z512Y-XXXPM1	512K x 8	DS1250Y-XXX
M46Z128-XXXPM1	128K x 16	DS1258AB-XXX
M46Z128Y-XXXPM1	128K x 16	DS1258Y-XXX

# Thermal Sensors

Systems perform best within a known temperature range. Being able to alert the system of conditions outside the optimum operating range and act on the information can be a real product advantage. Products protected by Dallas Semiconductor Thermal Management Products can help increase performance, reliability, and user satisfaction. Adding the benefits of thermal management is a simple process using the all-silicon, direct-to-digital Dallas temperature sensors.

## Direct-To-Digital Operation

Dallas Semiconductor's thermal sensors provide a direct temperature reading in digital form, eliminating the need for dedicated A/D converters. They are capable of measuring temperature over the -55°C to +125°C range (-67°F to +257°F) in increments as low as 0.03125°C to 1.0°C, depending on the chosen resolution. Ease of use is enhanced because each device is factory-calibrated, thus requiring no linearity corrections or other compensation to be performed by the user.

Applications requiring multi-point sensing are easily accommodated with temperature sensors that support multi-drop operation. This option is supported with a choice of 2-wire or the Dallas 1-Wire™ interface.

## Match Your Application with an Array of Product Features

Dallas makes temperature management easier with a range of product features. Basic choices include having both temperature and thermostat functions. The volume you need may also allow you to take advantage of the value-added option of factory-programmed thermostat setpoints.

For other unique applications, consider a programmable standalone thermostat to control a heat limit switch or fan control. Your application could also benefit from a temperature sensor and 256 bytes of EEPROM memory for temperature correction coefficients or other system management lookup tables.

With the broadest product line available, Dallas Semiconductor's sensors provide a range and accuracy unparalleled in the industry.

## Demonstration and Evaluation Kits Let You Get the Most from Your Design

Product support is available when you need it most: when you're evaluating a product for a critical design. Our evaluation and demonstration kits allow you to try the device in your own lab, with your own design. Kits are complete with DOS/Windows software and interface electronics.

## Applications

- ◆ Fan control for computing equipment
- ◆ Clock speed adjustment to minimize temperature rise to high-power microprocessors like Pentium, Alpha, and PowerPC
- ◆ Scientific and analytical measurements
- ◆ Building automation and environmental controls
- ◆ Temperature compensation of crystal oscillators in sensitive time or frequency measurement applications such as cellular telephone handsets

## Selection Table

### Thermal Sensors

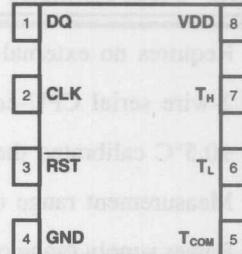
14

Product/ Interface	Package	Calibrated Accuracy	Resolution	Multidrop	Special Functions	Product Available	Demo Available
DS1620 3-Wire	8-pin PDIP 8-pin SOIC	$\pm 0.5^\circ\text{C}$	> 9 Bits	No	Standalone thermostat	Now	<i>Yes!</i>
DS1620R 3-Wire	16-pin SOIC	$\pm 0.5^\circ\text{C}$	> 9 Bits	No	Self heating by means of internal 50 $\Omega$ resistor	Now	No
DS1621 2-Wire	8-pin PDIP 8-pin SOIC	$\pm 0.5^\circ\text{C}$	> 9 Bits	8		Now	<i>Yes!</i>
DS1624 2-Wire	8-pin PDIP 8-pin SOIC	$\pm 0.5^\circ\text{C}$	13 Bits	8	256 bytes of E <sup>2</sup> PROM	Now	No
DS1629 2-Wire	8-pin SOIC	$\pm 2.0^\circ\text{C}$	> 9 Bits	No	Real time clock and calendar	Contact Factory	No
DS1720 3-Wire	8-pin PDIP 8-pin SOIC	$\pm 2.5^\circ\text{C}$	> 9 Bits	No	Low-cost version of the DS1620	Now	Can use DS1620 Kit
DS1721 2-Wire	8-pin SOIC	$\pm 1.0^\circ\text{C}$	> 9 Bits	8	Low-cost 2-wire digital thermometer	Contact Factory	No
DS1780 2-Wire	24-pin TSSOP	$\pm 2.0^\circ\text{C}$	9 Bits	4	6 A/D inputs; 2 tachometer inputs; internal DAC for fan speed control	Now	<i>Yes!</i>
DS1820 1-Wire™	PR-35; 16-pin SSOP	$\pm 0.5^\circ\text{C}$	> 9 Bits	Infinite	MicroLAN sensor	Now	<i>Yes!</i>
DS1821 1-Wire™	PR-35; 8-pin SOIC; TO-220	$\pm 1.0^\circ\text{C}$	> 8 Bits	No	Standalone thermostat	Now	<i>Yes!</i>
DS75 2-Wire	8-pin SOIC	$\pm 2.0^\circ\text{C}$	> 9 Bits	8	LM75 pin-compatible	Now	No

# Featured Products

## DS1620 Digital Thermometer and Thermostat

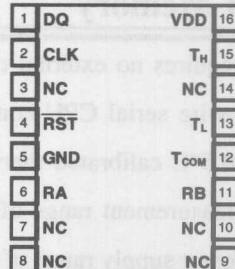
- ◆ Requires no external components
- ◆ 3-wire serial CPU-controlled interface
- ◆  $\pm 0.5^\circ\text{C}$  calibrated thermometer accuracy
- ◆ Measurement range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- ◆ Power supply range of  $2.7\text{V} \leq V_{\text{DD}} \leq 5.5\text{V}$
- ◆ 3 dedicated thermostat logic outputs
- ◆ Thermostat settings are user-definable and nonvolatile
- ◆ 300-mil, 8-pin DIP (DS1620) or 208-mil SO8 (DS1620S) packages
- ◆ Pre-programmed option available
- ◆ Demo kit available



**DS1620**  
8-pin DIP  
8-pin SOIC (208 mil)

## DS1620R Self-Heating Temperature Sensor

- ◆ Internal  $50\Omega$  resistor increases temperature approximately  $40^\circ\text{C}$  in still air (with  $5\text{V}$  across R)
- ◆ 3-wire serial CPU-controlled interface
- ◆  $\pm 0.5^\circ\text{C}$  thermometer accuracy
- ◆ Die measurement range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- ◆ 3 dedicated thermostat logic outputs
- ◆ Thermostat settings are user-definable and nonvolatile
- ◆ 300-mil SO16 (DS1620R) package
- ◆ Pre-programmed option available
- ◆ Applications include fan speed measurement/control in PCs/servers

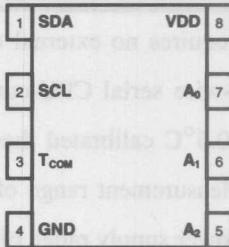


**DS1620R**  
16-pin SOIC (300 mil)

# Featured Products

## DS1621 Digital Thermometer and Thermostat

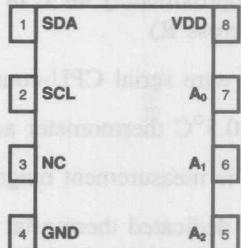
- ◆ Requires no external components
- ◆ 2-wire serial CPU-controlled interface
- ◆  $\pm 0.5^\circ\text{C}$  calibrated thermometer accuracy
- ◆ Measurement range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- ◆ Power supply range of  $2.7\text{V} \leq V_{cc} \leq 5.5\text{V}$
- ◆ Dedicated hysteresis thermostat logic output
- ◆ Thermostat settings are user-definable and nonvolatile
- ◆ Addressability allows multi-sense operation
- ◆ 300-mil, 8-pin DIP (DS1621), 150-mil SO8 (DS1621S) or 208-mil SO8 (1621V) packages
- ◆ Demo kit available



**DS1621**  
8-pin DIP  
8-pin SOIC (150 mil)  
8-pin SOIC (208 mil)

## DS1624 Digital Thermometer and Memory

- ◆ Requires no external components
- ◆ 2-wire serial CPU-controlled interface
- ◆  $\pm 0.5^\circ\text{C}$  calibrated thermometer accuracy
- ◆ Measurement range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- ◆ Power supply range of  $2.7\text{V} \leq V_{cc} \leq 5.5\text{V}$
- ◆ 256 bytes of user-programmable EEPROM
- ◆ 13-bit readout resolution
- ◆ Addressability allows multi-sense operation
- ◆ 300-mil, 8-pin DIP (DS1624) or 208-mil SO8 (DS1624S) packages

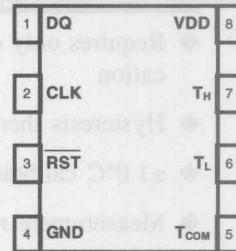


**DS1624**  
8-pin DIP  
8-pin SOIC (300 mil)

# Featured Products

## DS1720 Econo-Digital Thermometer and Thermostat

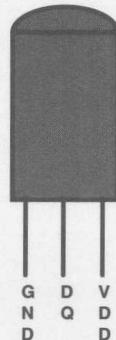
- ◆ DS1620S pin/software compatibility
- ◆ Requires no external components
- ◆ 3-wire serial CPU-controlled interface
- ◆  $\pm 2.5^\circ\text{C}$  calibrated thermometer accuracy
- ◆ Measurement range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- ◆ Power supply range of  $2.7\text{V} \leq V_{cc} \leq 5.5\text{V}$
- ◆ 3 dedicated thermostat logic outputs
- ◆ Thermostat settings are user-definable and nonvolatile
- ◆ 208-mil SO8 (DS1720S) package
- ◆ Pre-programmed option available



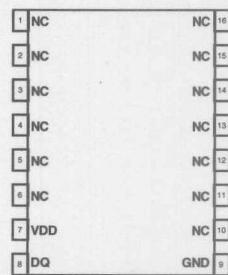
DS1720S  
208-mil SO8

## DS1820 1-Wire™ Digital Thermometer

- ◆ Requires only one port pin for communication
- ◆ Multidrop capability simplifies distributed temperature sensing applications
- ◆ Zero standby power
- ◆  $\pm 0.5^\circ\text{C}$  calibrated thermometer accuracy
- ◆ Measurement range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- ◆ Alarm settings are user-definable and nonvolatile
- ◆ PR-35 (DS1820) or 16-pin SSOP (DS1820S) packages
- ◆ Demo kit available



DS1820  
PR-35

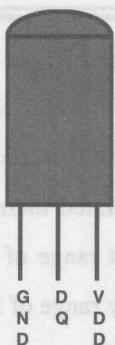


DS1820S  
16-pin SSOP

# Featured Products

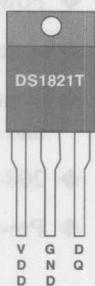
## DS1821 Programmable Digital Thermostat

- ◆ Requires only one port pin for communication
- ◆ Hysteresis thermostat open-drain output
- ◆  $\pm 1.0^\circ\text{C}$  calibrated thermometer accuracy
- ◆ Measurement range of  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$
- ◆ Thermostat settings are user-definable and nonvolatile
- ◆ PR-35 (DS1821), 208-mil SO8 (DS1821S), and TO-220 (DS1821T) packages
- ◆ Demo kit available



DS1821S  
208-mil SO8

DS1821  
PR-35



DS1821T  
TO-220

# New Products

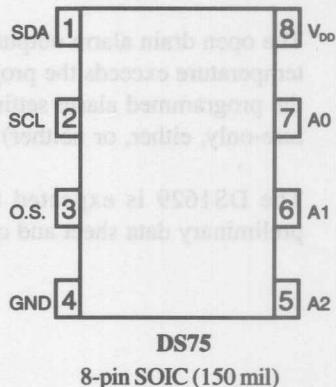
## DS75 2-Wire Thermal Watchdog

The DS75 Thermal Watchdog provides a 9, 10, 11, or 12-bit digital reading that indicates device temperature. The device can also act as a thermostat. As a thermostat, the alarm output of the DS75 (O.S.) is activated when the temperature exceeds the temperature limit specified by the user. The user can also specify the number of consecutive faults required to activate O.S., as well as the method to clear the fault condition.

The DS75 has 3 address bits, A0-A2, that allow a user to multi-drop up to 8 sensors along the 2-wire bus, greatly simplifying the bussing of distributed temperature sensing networks. Additionally, the device is able to operate over the 2.7V to 5.5V voltage range, therefore making it applicable in both 3V and 5V systems.

The DS75 is in full production. Samples and pricing can be obtained by contacting your local distributor or representative.

- ◆ Pin/software-compatible to the LM75CIM-x Thermal Watchdog in 9-bit (default) mode
- ◆ Data is read/written via a 2-wire serial interface (open drain I/O lines); the device is 3-bit addressable
- ◆ Resolution can be enhanced to 10, 11, or 12 bits by adjusting device configuration in software
- ◆ Thermometer accurate  $\pm 2.0^{\circ}\text{C}$  over  $-25^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  range and  $\pm 3.0^{\circ}\text{C}$  over full temperature range
- ◆ Supply voltage range 2.7V to 5.5V



### Pin Descriptions

SDA	- 2-Wire serial data input/output
SCL	- 2-Wire serial clock
GND	- Ground
O.S.	- Thermostat output signal
A0	- Chip address input
A1	- Chip address input
A2	- Chip address input
V <sub>DD</sub>	- Power supply voltage (2.7V - 5.5V)

# New Products

## DS1629 2-Wire Thermometer and Real Time Clock

The DS1629 integrates the critical functions of a real time clock and temperature monitor in a small-outline 8-pin SOIC package. Communication to the DS1629 is accomplished via a 2-wire interface. The wide power supply range and minimal power requirement of the DS1629 allow for accurate time/temperature measurements in battery-powered applications.

The digital thermometer provides 9-bit temperature readings which indicate the temperature of the device. No additional components are required. The calibrated accuracy of the device is  $\pm 2.0^{\circ}\text{C}$ . The clock/calendar provides seconds, minutes, hours, day, date of the month, day of the week, month, and year. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap years. The DS1629 operates in either a 12- or 24-hour format with AM/PM indicator in the 12-hour mode.

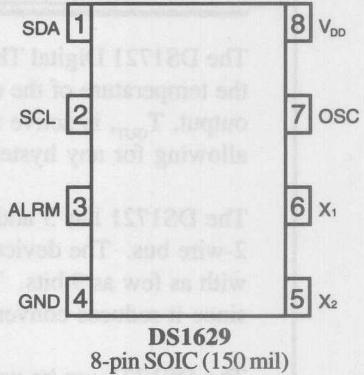
The open drain alarm output of the DS1629 will become active when either the measured temperature exceeds the programmed over-temperature limit (TH) or current time reaches the programmed alarm setting. The user can configure which event (time-only, temperature-only, either, or neither) will generate an alarm condition.

The DS1629 is expected to be sampling by mid-3Q98. Consult the factory for a preliminary data sheet and contact your local sales representative for pricing information.

# New Products

## DS1629 2-Wire Digital Thermometer and Real Time Clock

- ◆ Data is read/written via a 2-wire serial interface
- ◆ Thermometer accuracy calibrated to  $\pm 2.0^{\circ}\text{C}$
- ◆ Real time clock counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation through the year 2100
- ◆ Temperature resolution is configurable from 9 to 12 (default) bits ( $0.5^{\circ}\text{C}$  to  $0.0625^{\circ}\text{C}$  increments)
- ◆ Thermostatic and time alarm settings are user definable; dedicated open-drain alarm output
- ◆ 32 bytes SRAM for general data storage
- ◆ Wide power supply range (2.7V to 5.5V)
- ◆ 8-pin, 150-mil SOIC



### Pin Descriptions

SDA	- 2-Wire serial data input/output
SCL	- 2-Wire serial clock
GND	- Ground
ALRM	- Thermostat & clock alarm output
X <sub>1</sub>	- 32.768 kHz Crystal
X <sub>2</sub>	- 32.768 kHz Crystal
OSC	- Buffered oscillator output
V <sub>DD</sub>	- Power supply voltage (2.7V – 5.5V)

# New Products

## DS1721 2-Wire Digital Thermometer and Thermostat

The DS1721 Digital Thermometer and Thermostat provides a 12-bit reading that indicates the temperature of the device. The device can also act as a thermostat. The thermal alarm output,  $T_{OUT}$ , is active until the temperature drops below a user-defined temperature,  $TL$ , allowing for any hysteresis necessary.

The DS1721 has 3 address bits that allow a user to multi-drop up to 8 sensors along the 2-wire bus. The device can also be adjusted by the user to provide a temperature readout with as few as 9 bits. This is useful for applications that require a faster conversion time, since it reduces conversion time from 1.2s (max for 12 bits) to 150ms (max for 9 bits).

The DS1721 can be used in existing DS1621 designs with little or no software modifications, providing a cost-reduced solution with minimal or no design modifications.

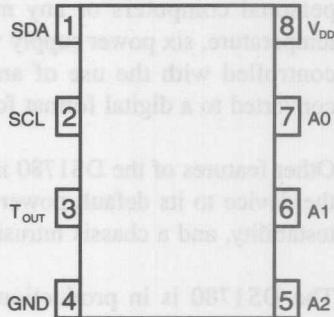
The DS1721 will be sampling Q3 1998. Consult the factory for a preliminary data sheet and contact your local sales representative for pricing.



# New Products

## DS1721 2-Wire Digital Thermometer and Thermostat

- ◆ Data is read/written via a 2-wire serial interface and has 3-bit addressability for multi-drop functionality
- ◆ Thermometer accuracy calibrated to  $\pm 1.0^\circ\text{C}$
- ◆ Temperature resolution is configurable from 9 to 12 (default) bits ( $0.5^\circ\text{C}$  to  $0.0625^\circ\text{C}$  increments)
- ◆ Thermostatic settings are user-definable
- ◆ Wide power supply range (2.7V to 5.5V)
- ◆ 150-mil SOIC package



**DS1721**  
8-pin SOIC (150 mil)

### Pin Descriptions

SDA - 2-Wire serial data input/output  
SCL - 2-Wire serial clock  
GND - Ground  
T<sub>OUT</sub> - Thermostat output signal  
O.S. - Thermostat output signal  
A0 - Chip address input  
A1 - Chip address input  
A2 - Chip address input  
V<sub>DD</sub> - Power supply voltage (2.7V – 5.5V)

# New Products

## DS1780 CPU Peripheral Monitor

The DS1780 is a highly integrated system instrumentation monitor ideal for use in personal computers or any microprocessor-based system. It can monitor ambient temperature, six power supply voltages, and the speed of two fans. Fan speed can also be controlled with the use of an internal 8-bit DAC. All measurements are internally converted to a digital format for easy processing by the CPU.

Other features of the DS1780 include a remote reset function which can be used to return the device to its default power up state, an internal NAND tree function for board level testability, and a chassis intrusion input to enhance system security.

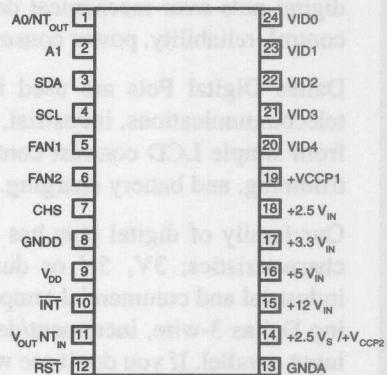
The DS1780 is in production now. Contact your local distributor or representative for samples and pricing.



# New Products

## DS1780 CPU Peripheral Monitor

- ◆ Temperature sensor requires no external circuitry or user calibration
- ◆ Data is read/written via a 2-wire serial interface
- ◆ Two fan speed sensors
- ◆ Monitors 6 power supply voltages
- ◆ System interrupt availability on all monitored functions (temperature, voltages, fan speed)
- ◆ Wide power supply range (2.8V – 5.75V)



**DS1780**  
24-pin TSSOP (173mil)

### Pin Descriptions

A0/NT <sub>OUT</sub>	- Address input/NAND tree output
A1	- Address inputs
SDA	- 2-Wire serial data input/output
SCL	- 2-Wire serial clock
FANx	- Tachometer inputs
CHS	- Chassis intrusion detector input
GNDD	- Digital ground
V <sub>DD</sub>	- Power supply voltage (2.8V-5.75V)
INT	- Hardware interrupt output
V <sub>OUT</sub> /NT <sub>IN</sub>	- DAC output/NAND tree input
RST	- Remote system reset
GND	- Analog ground
+xxV <sub>IN</sub>	- Positive voltage inputs
+2.5 V <sub>s</sub> /+V <sub>CCP2</sub>	- Positive/negative voltage input
VIDx	- Processor voltage supply readout inputs

# Digital Potentiometers

Dallas Semiconductor has been manufacturing digital pots since 1989, when we introduced the DS1267 Dual Digital Potentiometer. Why are so many companies choosing digital pots over mechanical devices? The digital solution offers advantages in device control, reliability, power consumption, accuracy, manufacturing, and packaging options.

Dallas Digital Pots are used in all market segments, including personal computers, telecommunications, industrial, audio, multi-media, and automotive. Applications range from simple LCD contrast control to volume and tone control, automatic gain control, trimming, and battery charging.

Our family of digital pots has grown to 17. Current devices offer linear or non-linear characteristics; 3V, 5V or dual ( $\pm 5V$ ) operation; volatile and nonvolatile versions; industrial and commercial temperature grades; and five interface control options, including Dallas 3-wire, increment/decrement, pushbutton control, 2-wire addressable, and 3-input parallel. If you don't see what you need here, give us a call. We have worked with a variety of customers to meet their needs.

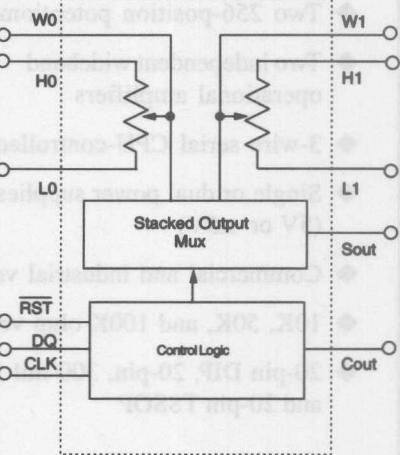
## Selection Table

Device	Pots/ Package	Wiper Memory	# of Positions	Resistance	Power Supply	Control Interface
DS1267	2	Volatile	256-Lin	10K, 50K, 100K	5V, $\pm 5V$	3-Wire Serial
DS1666	1	Volatile	128-Lin	10K, 50K, 100K	5V, $\pm 5V$	Increment/Decrement
DS1667	2	Volatile	256-Lin	10K, 50K, 100K	5V, $\pm 5V$	3-Wire Serial
DS1669	1	Nonvolatile	64-Lin	10K, 50K, 100K	4.5V to 8.0V	Contact-Closure
DS1800	2	Volatile	128-Log	52K	2.7V to 5.5V	3-Wire Serial
DS1801	2	Volatile	64-Log	45K	2.7V to 5.5V	3-Wire Serial
DS1802	2	Volatile	64-Log	50K	2.7V to 5.5V	3-Wire Serial
DS1803	2	Volatile	256-Lin	10K, 50K, 100K	2.7V to 5.5V	2-Wire Addressable
DS1804	1	Nonvolatile	100-Lin	10K, 50K, 100K	2.7V to 5.5V	Increment/Decrement
DS1806	6	Volatile	64-Lin	10K, 50K, 100K	2.7V to 5.5V	3-Wire Serial
DS1807	2	Volatile	64-Log	45K	2.7V to 5.5V	2-Wire Addressable
DS1809	1	Nonvolatile	64-Lin	10K, 50K, 100K	2.7V to 5.5V	Contact-Closure
DS1844	4	Volatile	64-Lin	10K, 50K, 100K	2.7V to 5.5V	5-Wire, 2 Wire
DS1866	1	Volatile	8-Log	10K	2.7V to 5.5V	3-Input Parallel
DS1867	2	Nonvolatile	256-Lin	10K, 50K, 100K	5V, $\pm 5V$	3-Wire Serial
DS1868	2	Volatile	256-Lin	10K, 50K, 100K	5V, $\pm 3V$	3-Wire Serial
DS1869	1	Nonvolatile	64-Lin	10K, 50K, 100K	3.0V to 8.0V	Contact-Closure

# Featured Products

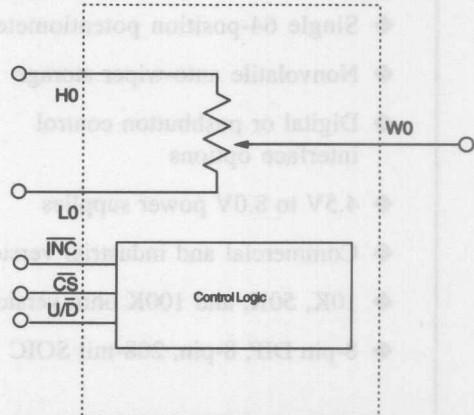
## DS1267 Dual Digital Potentiometer

- ◆ Two 256-position potentiometers
- ◆ 3-wire serial CPU-controlled interface
- ◆ Single or dual power supply operation (5V or  $\pm 5V$ )
- ◆ Daisy chain capability
- ◆ Industrial version only
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 14-pin DIP, 16-pin, 300-mil SOIC, and 20-pin TSSOP



## DS1666 Audio Taper Potentiometer

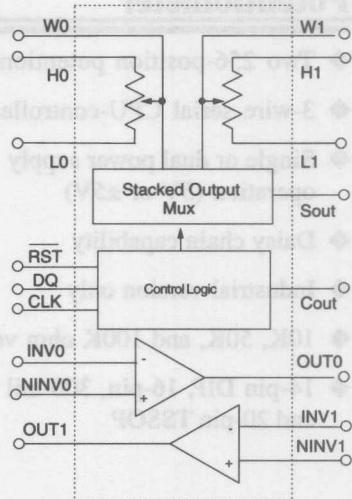
- ◆ Single 128-position potentiometer
- ◆ Tapered resistive characteristic
- ◆ Single or dual power supply operation (5V or  $\pm 5V$ )
- ◆ Increment/decrement control interface
- ◆ Power-up position 13
- ◆ Industrial version only
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 14-pin DIP, 16-pin, 300-mil SOIC



# Featured Products

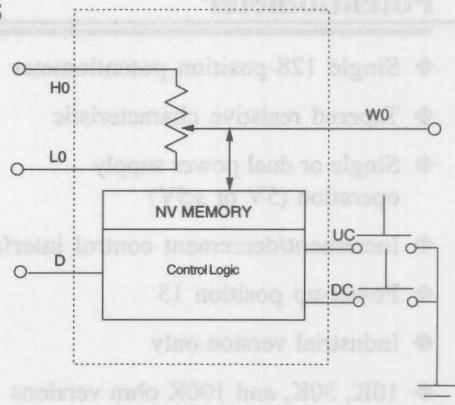
## DS1667 Dual Digital Potentiometer w/Op Amps

- ◆ Two 256-position potentiometers
- ◆ Two independent wideband operational amplifiers
- ◆ 3-wire serial CPU-controlled interface
- ◆ Single or dual power supplies (5V or  $\pm 5V$ )
- ◆ Commercial and industrial versions
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 20-pin DIP, 20-pin, 300-mil SOIC, and 20-pin TSSOP



## DS1669 Dallastat™

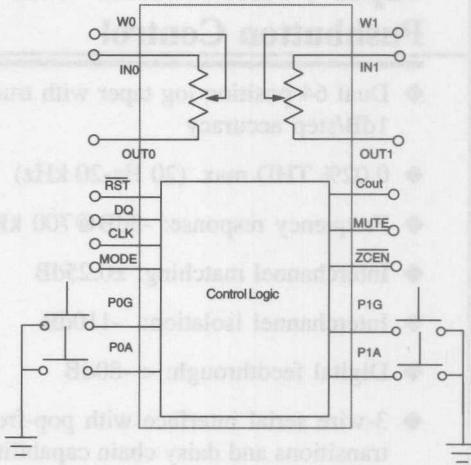
- ◆ Single 64-position potentiometer
- ◆ Nonvolatile auto-wiper storage
- ◆ Digital or pushbutton control interface options
- ◆ 4.5V to 8.0V power supplies
- ◆ Commercial and industrial versions
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 8-pin DIP, 8-pin, 208-mil SOIC



# Featured Products

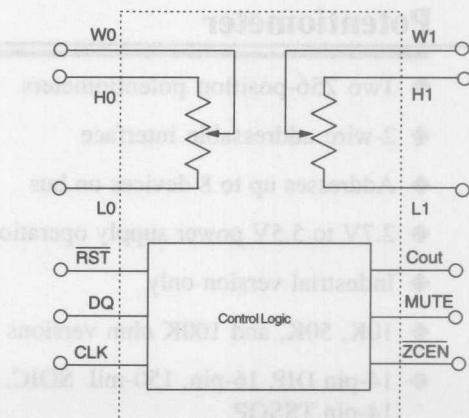
## DS1800 Dual Inverting Log Gain/Attenuator

- ◆ Dual 128-position log taper
- ◆ Gain/attenuation range: +20dB to -63dB
- ◆ Frequency response: -3dB@1MHz
- ◆ Interchannel matching:  $\pm 0.25\text{dB}$
- ◆ Interchannel isolation: -110dB
- ◆ Digital feedthrough: < -80dB
- ◆ 3-wire serial interface with pop-free transitions, pushbutton control operation, and daisy chain capability
- ◆ 2.7V to 5.5V power supply operation
- ◆ 45K ohm version
- ◆ 20-pin DIP, 20-pin, 300-mil SOIC, and TSSOP



## DS1801 Dual Digital Audio Taper Potentiometer

- ◆ Dual 64-position log taper with true 1dB/step accuracy
- ◆ 0.02% THD max. (20 Hz-20 kHz)
- ◆ Frequency response: -3dB @700 kHz
- ◆ Interchannel matching:  $\pm 0.25\text{dB}$
- ◆ Interchannel isolation: -110dB
- ◆ Digital feedthrough: < -80dB
- ◆ 3-wire serial interface with pop-free transitions and daisy chain capability
- ◆ 2.7V to 5.5V power supply operation
- ◆ 14-pin DIP, 14-pin TSSOP and 16-pin, 300-mil SOIC
- ◆ Industrial version only



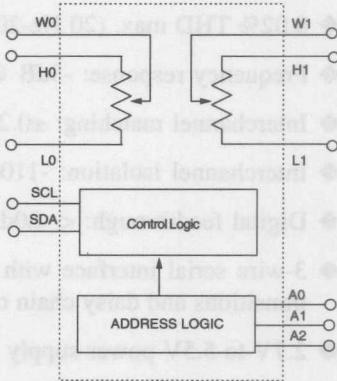
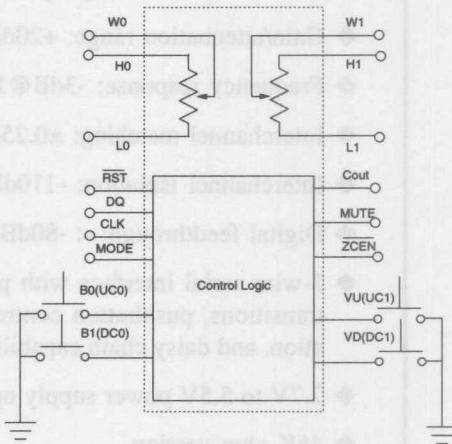
# Featured Products

## DS1802 Dual Digital Audio Taper Potentiometer with Pushbutton Control

- ◆ Dual 64-position log taper with true 1dB/step accuracy
- ◆ 0.02% THD max. (20 Hz-20 kHz)
- ◆ Frequency response: -3dB@700 kHz
- ◆ Interchannel matching:  $\pm 0.25$ dB
- ◆ Interchannel isolation: -110dB
- ◆ Digital feedthrough: < -80dB
- ◆ 3-wire serial interface with pop-free transitions and daisy chain capability
- ◆ Manually controlled, contact-closure interface
- ◆ 2.7V to 5.5V power supply operation
- ◆ 20-pin DIP, 300-mil SOIC, and TSSOP
- ◆ Commercial version only

## DS1803 Dual Addressable Potentiometer

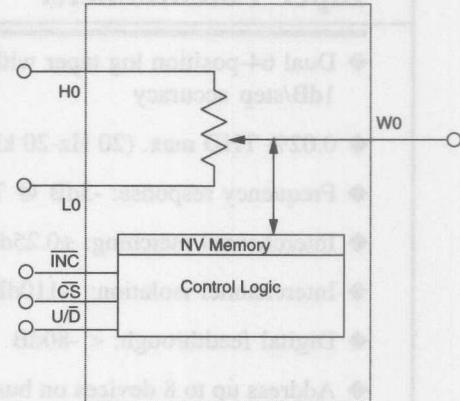
- ◆ Two 256-position potentiometers
- ◆ 2-wire addressable interface
- ◆ Addresses up to 8 devices on bus
- ◆ 2.7V to 5.5V power supply operation
- ◆ Industrial version only
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 14-pin DIP, 16-pin, 150-mil SOIC, and 14-pin TSSOP



# Featured Products

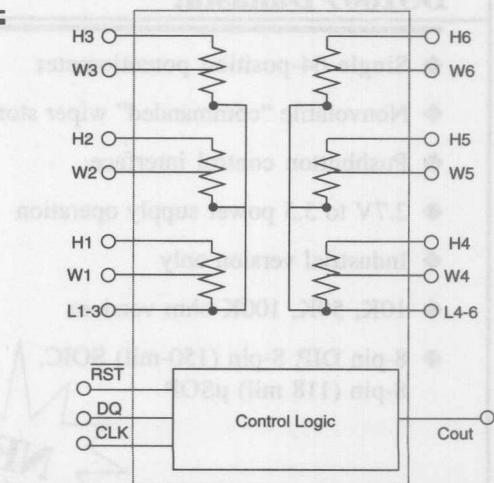
## DS1804 NV Trimmer Potentiometer

- ◆ Single 100-position nonvolatile potentiometer
- ◆ Linear resistor characteristic
- ◆ 2.7V to 5.5V power supply operation
- ◆ Increment/decrement control interface
- ◆ Wiper position stored on-demand
- ◆ Powers up to last stored wiper position
- ◆ Industrial version only
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 8-pin DIP, 8-pin, 150-mil SOIC



## DS1806 Digital Sextet Potentiometer

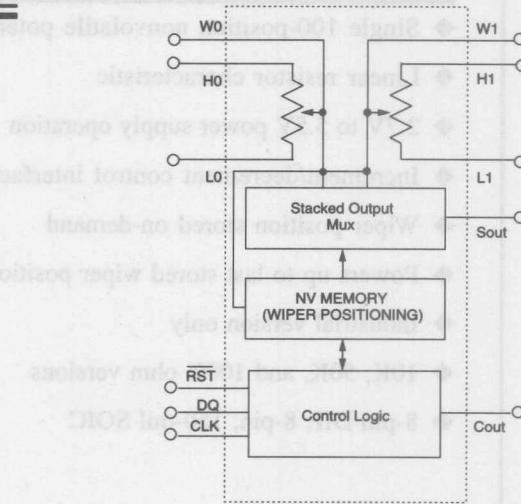
- ◆ Single 64-position potentiometer
- ◆ 3-wire serial CPU-controlled interface
- ◆ 2.7V to 5.5V power supply operation
- ◆ Daisy chain capability
- ◆ Industrial version only
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 20-pin DIP, 20-pin, 300-mil SOIC and 20-pin TSSOP



# Featured Products

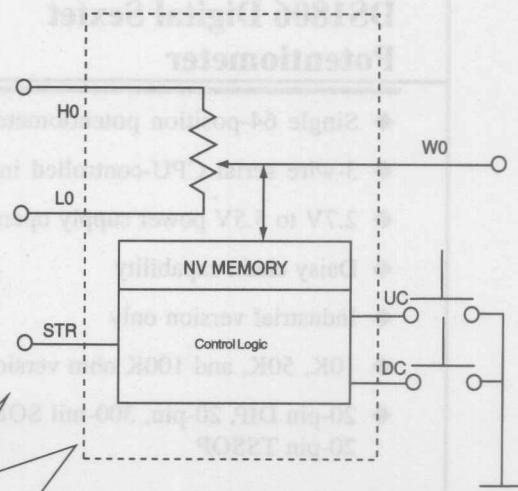
## DS1807 Dual Audio Taper Potentiometer

- ◆ Dual 64-position log taper with true 1dB/step accuracy
- ◆ 0.02% THD max. (20 Hz-20 kHz)
- ◆ Frequency response: -3dB @ 700 kHz
- ◆ Interchannel matching:  $\pm 0.25\text{dB}$
- ◆ Interchannel isolation: -110dB
- ◆ Digital feedthrough: < -80dB
- ◆ Address up to 8 devices on bus
- ◆ 2-wire addressable interface
- ◆ Industrial version only
- ◆ 2.7V to 5.5V power supply operation
- ◆ 14-pin DIP, 14-pin TSSOP, and 16-pin, 300-mil SOIC



## DS1809 Dallastat™

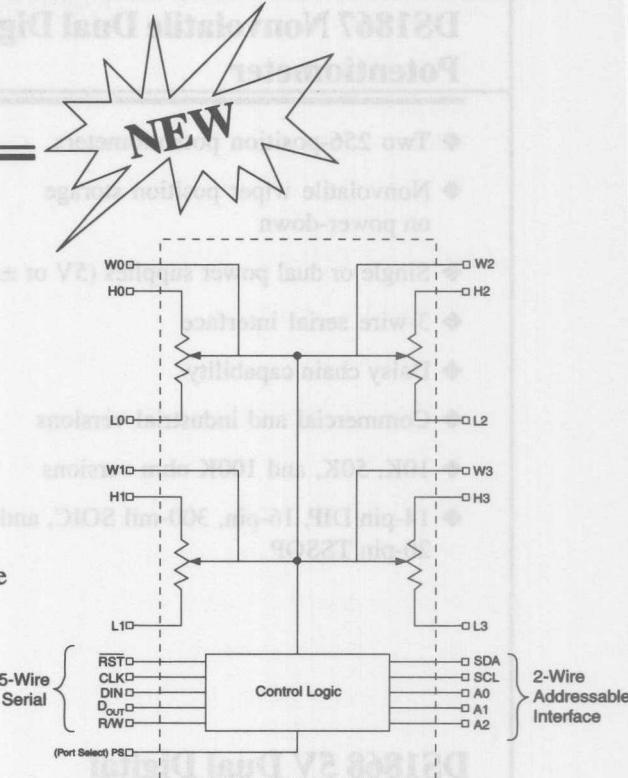
- ◆ Single 64-position potentiometer
- ◆ Nonvolatile "commanded" wiper storage
- ◆ Pushbutton control interface
- ◆ 2.7V to 5.5 power supply operation
- ◆ Industrial version only
- ◆ 10K, 50K, 100K ohm versions
- ◆ 8-pin DIP, 8-pin (150-mil) SOIC, 8-pin (118 mil) µSOP



# Featured Products

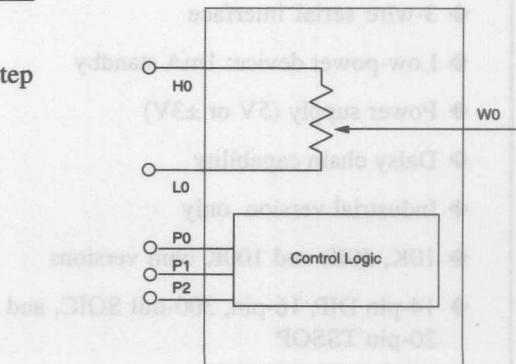
## DS1844 Quad Digital Potentiometer

- ◆ Quad 64-position potentiometer
- ◆ Two interface control options:
  - 5-wire serial
  - 2-wire addressable
- ◆ 2.7V to 5.5V power supply operation
- ◆ Industrial temperature grade only
- ◆ 10K, 50K, 100K ohm versions
- ◆ 20-pin DIP, 20-pin SOIC, and 20-pin TSSOP
- ◆ Mixed resistor combinations available (contact factory)



## DS1866 Log Trimmer Potentiometer

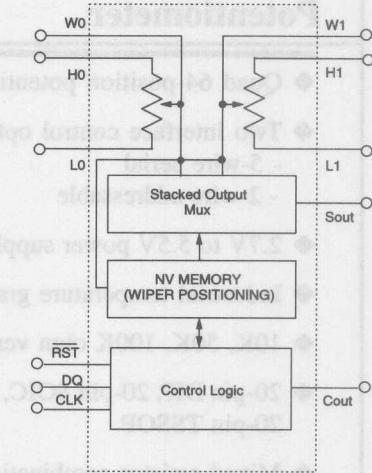
- ◆ Single 8-position potentiometer
- ◆ Tapered resistor characteristic: 5dB/step
- ◆ 2.7V to 5.5V power supply operation
- ◆ 3-terminal parallel interface control
- ◆ Wiper position powers up to state of parallel interface
- ◆ Industrial version only
- ◆ 10K ohm version
- ◆ 8-pin DIP, 8-pin, 150-mil SOIC



# Featured Products

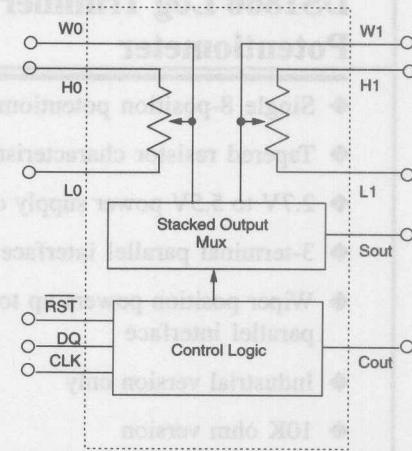
## DS1867 Nonvolatile Dual Digital Potentiometer

- ◆ Two 256-position potentiometers
- ◆ Nonvolatile wiper position storage on power-down
- ◆ Single or dual power supplies (5V or  $\pm 5V$ )
- ◆ 3-wire serial interface
- ◆ Daisy chain capability
- ◆ Commercial and industrial versions
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 14-pin DIP, 16-pin, 300-mil SOIC, and 20-pin TSSOP



## DS1868 5V Dual Digital Potentiometer

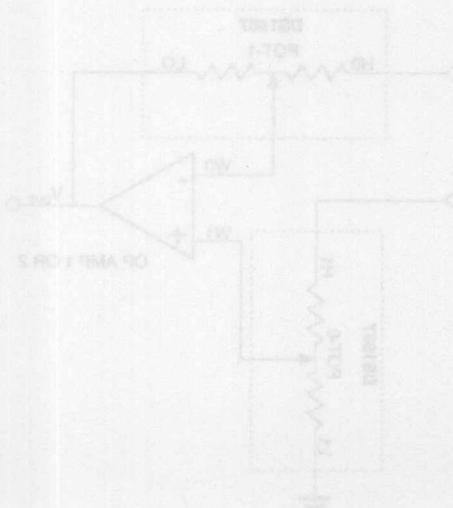
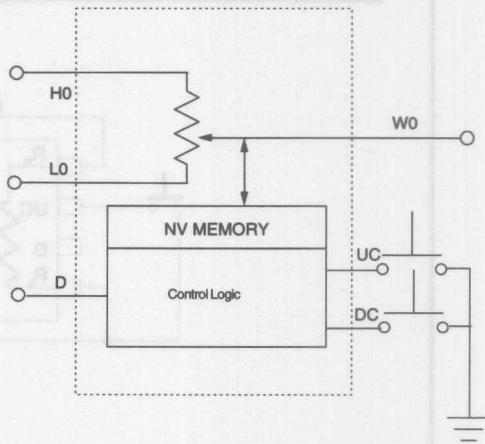
- ◆ Two 256-position potentiometers
- ◆ 3-wire serial interface
- ◆ Low-power device: 1mA standby
- ◆ Power supply (5V or  $\pm 3V$ )
- ◆ Daisy chain capability
- ◆ Industrial version only
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 14-pin DIP, 16-pin, 300-mil SOIC, and 20-pin TSSOP



# Featured Product

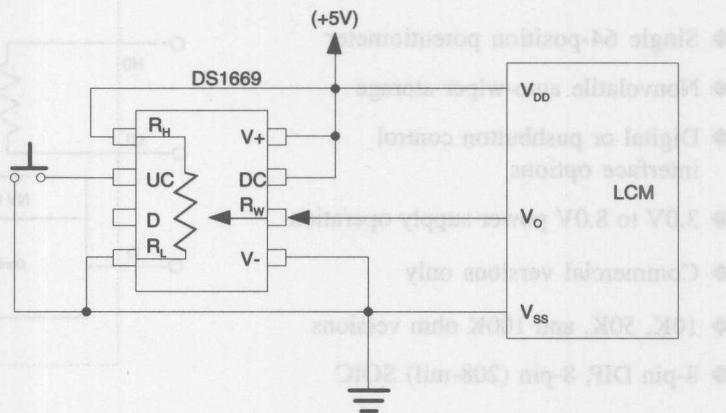
## DS1869 Dallastat™

- ◆ Single 64-position potentiometer
- ◆ Nonvolatile auto-wiper storage
- ◆ Digital or pushbutton control interface options
- ◆ 3.0V to 8.0V power supply operation
- ◆ Commercial versions only
- ◆ 10K, 50K, and 100K ohm versions
- ◆ 8-pin DIP, 8-pin (208-mil) SOIC

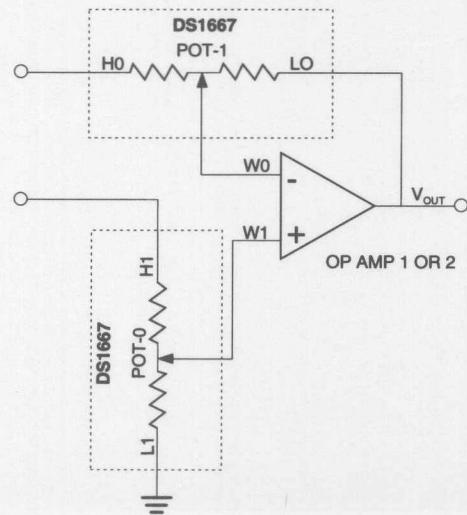


# Application Diagrams

## LCD Contrast Control Using the Dallastat

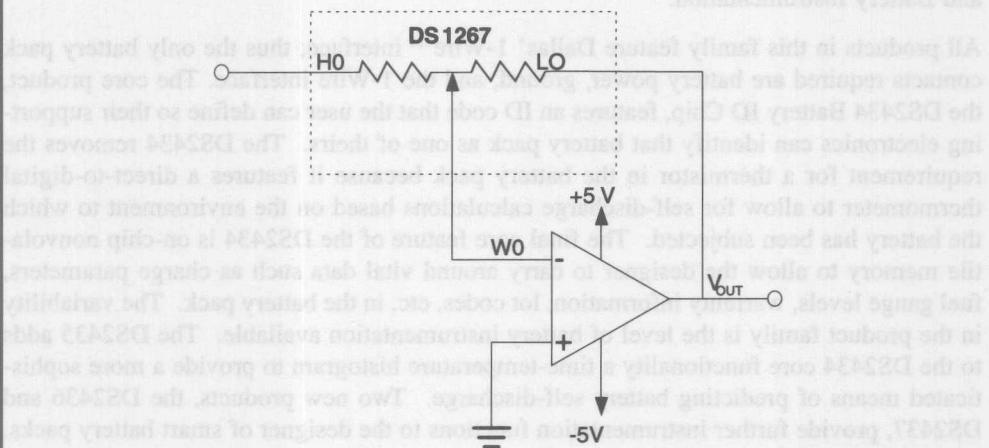


## Programmable Differential Amplifier Using the DS1667

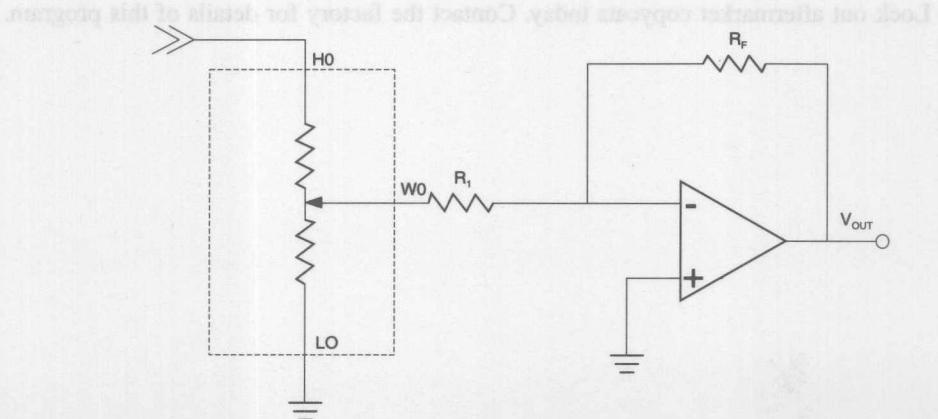


# Application Diagrams

## Inverting Variable Gain Amplifier



## Fixed Gain Attenuator Amplifier



# Battery Management

Dallas Semiconductor's Battery Management products target the growing demand for portable electronics such as notebook computers, pagers, cellular phones, and other handheld instrumentation. With the use of batteries on the rise, the need to manage this battery power source is growing. This family encompasses two categories: Battery Identification and Battery Instrumentation.

All products in this family feature Dallas' 1-Wire™ interface; thus the only battery pack contacts required are battery power, ground, and the 1-Wire interface. The core product, the DS2434 Battery ID Chip, features an ID code that the user can define so their supporting electronics can identify that battery pack as one of theirs. The DS2434 removes the requirement for a thermistor in the battery pack because it features a direct-to-digital thermometer to allow for self-discharge calculations based on the environment to which the battery has been subjected. The final core feature of the DS2434 is on-chip nonvolatile memory to allow the designer to carry around vital data such as charge parameters, fuel gauge levels, warranty information, lot codes, etc. in the battery pack. The variability in the product family is the level of battery instrumentation available. The DS2435 adds to the DS2434 core functionality a time-temperature histogram to provide a more sophisticated means of predicting battery self-discharge. Two new products, the DS2436 and DS2437, provide further instrumentation functions to the designer of smart battery packs.

Dallas Semiconductor Battery Management products offer demo kits, complete with DOS/Windows software and interface electronics to allow users to explore the capabilities of these products without expending time and energy. We also offer value-added options for the Battery Management products to allow an OEM to purchase a Battery ID/Instrumentation product with a custom ID that will only be sold to that OEM.

Lock out aftermarket copycats today. Contact the factory for details of this program.

# Applications

## DS243x Battery ID

- ◆ Unique battery pack identification
- ◆ Nonvolatile storage of critical data in the battery pack such as charging instructions/limits, warranty information, fuel gauge data, disposal information
- ◆ End products include portable/cellular telephones, medical instruments, electronic clipboards, portable computers, or any portable electronics powered by a battery pack

## Selection Table

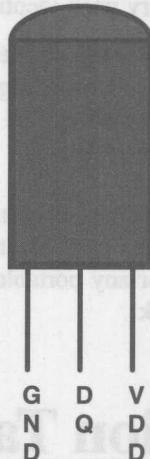
Product	Packaging	Interface	Power Supply	ID	Instrumentation	Instrum. Accuracy	Memory	Parts Available?	Demo Available?
DS2434	PR-35 209-mil SSOP16	1-Wire	2.5V-6.4V	2-byte ID	Thermometer	$\pm 0.5^{\circ}\text{C}$	32 bytes SRAM 32 bytes E <sup>2</sup> PROM	Now!	Yes! DS2434K
DS2435	PR-35 209-mil SSOP16	1-Wire	2.5V-6.4V	2-byte ID	Thermometer Time/Temp Histogram Elapsed Time Counter	$\pm 0.5^{\circ}\text{C}$ $\pm 0.5^{\circ}\text{C}$ $\pm 10\%$	32 bytes SRAM 32 bytes E <sup>2</sup> PROM	Now!	Yes! DS2435K
DS2436	PR-35 209-mil SSOP16	1-Wire	2.7V-10V	64-bit S/N 2-byte ID	Thermometer Voltage A/D	$\pm 2.0^{\circ}\text{C}$ $\pm 50\text{mV}$	8 bytes SRAM 32 bytes E <sup>2</sup> PROM	Now!	No
DS2437	SSOP16	1-Wire	2.7V-10V	64-bit S/N	Thermometer Voltage A/D Current A/D Elapsed Time Counter Fuel Gauge	$\pm 2.0^{\circ}\text{C}$ $\pm 50\text{mV}$ $\pm 2\%$ * * $\pm 5\%$	40 bytes E <sup>2</sup> PROM	Now!	Yes! DS2437K

\*Refer to respective data sheet for instrumentation accuracy spec conditions.

# Featured Products

## DS2434 Battery Identification Chip

- ◆ Requires only one port pin for communication
- ◆ Provides unique ID number to battery packs
- ◆ Eliminates thermistors by sensing battery temperature on-chip
- ◆  $\pm 0.5^\circ\text{C}$  thermometer accuracy
- ◆ Measurement range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- ◆ 32 bytes of nonvolatile EEPROM and 32 bytes of volatile SRAM for storage of critical battery data
- ◆ Cycle counter
- ◆ PR-35 (DS2434) and 209-mil SSOP16 (DS2434S)
- ◆ DS2434K demo kit available



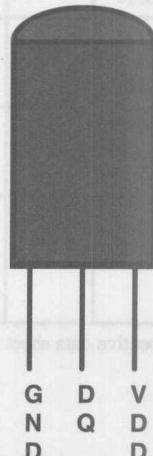
1	DQ	VDD	14
2	NC	NC	13
3	NC	NC	12
4	NC	NC	11
5	NC	NC	12
6	NC	NC	11
7	NC	NC	10
8	GND	GND	9

DS2434S  
209-mil SSOP16

DS2434  
PR-35

## DS2435 Battery Identification Chip with Time/Temperature Histogram

- ◆ Requires only one port pin for communication
- ◆ Provides unique ID number to battery packs
- ◆ Eliminates thermistors by sensing battery temperature on-chip
- ◆  $\pm 0.5^\circ\text{C}$  thermometer accuracy
- ◆ Measurement range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- ◆ Eight programmable bins to store time/temperature histogram data
- ◆ Programmable histogram update frequency
- ◆ 32 bytes of nonvolatile EEPROM and 32 bytes of volatile SRAM for storage of critical battery data
- ◆ Elapsed time counter (1 min. resolution)
- ◆ Cycle counter
- ◆ PR-35 (DS2435) package and 209-mil SSOP (DS2435S)
- ◆ DS2435K demo kit available



DS2435  
PR-35

# Featured Products

## DS2436 Battery Identification/ Monitor Chip

The DS2436 is a MicroLAN™-compatible battery monitor. It features the same core as the DS2434, that is a 2-byte ID code to allow an OEM to customize battery packs, a direct-to-digital thermometer to replace thermistors in battery packs, and on-chip nonvolatile memory for storage of critical data that is kept with the battery pack over its lifetime. Because it is MicroLAN-compatible, any number of battery packs containing the DS2436 can exist on the same 1-Wire™ bus. This allows multiple battery packs to be used in the same system or charger. Furthermore, other MicroLAN products (see Automatic Information section) can also be used on the same bus, either in the battery pack or in the host system. With the MicroLAN compatibility comes a unique 64-bit serial number laseried into each DS2436 chip. Therefore, the 2-byte ID can be used to uniquely identify a particular OEM's battery packs and the 64-bit serial number can be used to distinguish between that OEM's packs.

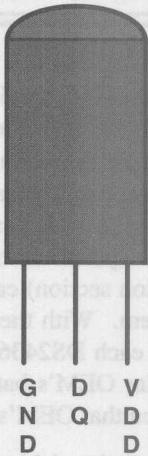
The distinguishing feature of the DS2436 in Dallas' Battery ID/Instrumentation family is a 10-bit battery voltage A/D converter. The  $V_{DD}$  (or battery power) input is also the A/D input. This feature could be used by the charging system to determine when to terminate charging if either the  $V_{MAX}$  or -dV termination methods are to be implemented. The presence of the direct-to-digital temperature sensor also allows for battery temperature-related charge termination techniques. The voltage and temperature also make use of data that could be used to produce a fuel gauge based solely on battery temperature and voltage.

Voltage measurement errors are minimized by including the converter inside the battery pack. This can eliminate the need for external A/D converters and multiplexers, further saving cost and real estate.

# Featured Products

## DS2436 Battery Identification/ Monitor Chip

- ◆ Requires only one port pin for communication
- ◆ Provides unique 2-byte ID number to battery packs
- ◆ Unique 64-bit serial number lasered into each part
- ◆ Multi-drop bus allows several battery packs containing DS2436 to be used in the same system or charger
- ◆ Eliminates thermistors by sensing battery temperature on-chip
- ◆  $\pm 2.0^\circ\text{C}$  thermometer accuracy
- ◆ 13-bit thermometer resolution
- ◆ Measurement range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- ◆ 10-bit battery voltage A/D converter
- ◆ 32 bytes of nonvolatile EEPROM and 8 bytes of volatile SRAM for storage of critical battery data
- ◆ PR-35 (DS2436) package and 209-mil SSOP16 (DS2436S; DS2436S same as DS2434S SSOP16)



# Featured Products

## DS2437 Smart Battery Monitor

The DS2437 is the flagship of Dallas' Battery Management family. It measures all parameters necessary for the host to calculate an accurate gas gauge and all parameters required for any charge termination technique ( $dT/dt_{MAX}$ ,  $V_{MAX}$ ,  $-dV_{MAX}$ ,  $T_{MAX}$ ).

Refer to the block diagram on page 45. Like the DS2436, the DS2437 features MicroLAN compatibility with a unique 64-bit serial number, a direct-to-digital temperature sensor, nonvolatile EEPROM memory, and a 10-bit battery voltage A/D converter. The DS2437 adds functionality to provide for the complete smart battery system. First, the voltage A/D is internally multiplexed so that the user can either measure the battery ( $V_{DD}$ ) voltage or some other voltage in the system via the  $V_{AD}$  input. This is useful because the battery voltage A/D input will only measure as specified for inputs in the range  $2.7V \leq V_{DD} \leq 10.0V$ . This is because  $V_{DD}$  is also the power input for the DS2437. If the  $V_{AD}$  input is used, the A/D will measure to spec for inputs ranging from  $0V \leq V_{AD} \leq 2V_{DD}$  to  $2.7V \leq V_{DD} \leq 5.0V$ .

The DS2437 also performs two types of current measurements. By measuring the voltage across the sense resistor ( $R_{SENS}$ ), the DS2437 effectively measures the instantaneous battery current with a 10-bit resolution. It does so in the background at the rate of about 32 times per second. The RC filter on the sense inputs allows high-amplitude, low duty cycle current peaks to be integrated into the measurement. These instantaneous measurements are then "accumulated" in a register. Positive (charging) current will increase the binary value of the register and negative (discharging) current will decrease the contents. The result is a binary representation of the net capacity (in C) remaining in the battery pack, not including second-order effects like temperature-related self discharge. This "Integrated Current Accumulator" is then the ground work for a fuel gauge.

These second-order effects can be approximated accurately using the elapsed time and temperature measurements made by the DS2437. If the system knows how long a battery has been out of the charger and what the temperature profile was during that time, the host software can compute the approximate loss of capacity due to temperature-related self-discharge, and run-rate. The adjustment is not hard-wired into the DS2437 because of the number of variables the user may take into account. The host software computes the value based on the type of battery chemistry being used in the battery pack. This allows the DS2437 to be used with any battery chemistry, from NiCd to Li-Ion.

# Featured Products

## DS2437 Smart Battery Monitor

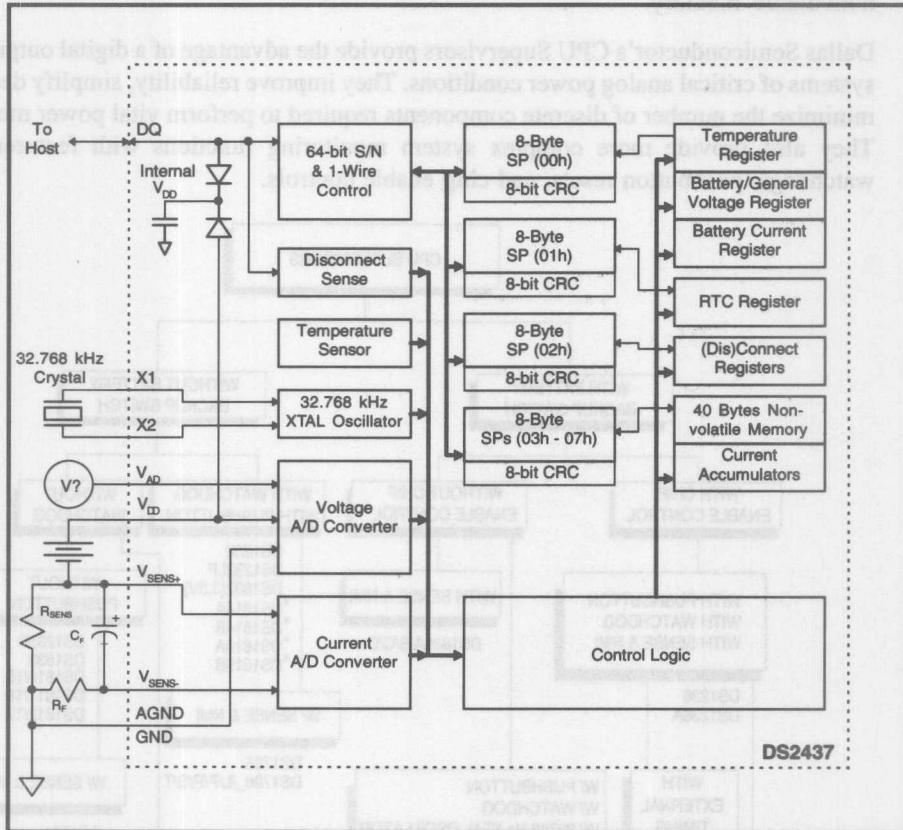
- ◆ Requires only one port pin for communication
- ◆ Unique 64-bit serial number lasered into each part
- ◆ Multi-drop bus allows several battery packs containing the DS2437 to be used in the same system or charger
- ◆ Eliminates thermistors by sensing battery temperature on-chip
- ◆  $\pm 2.0^\circ\text{C}$  thermometer accuracy
- ◆ 13-bit thermometer resolution
- ◆ Measurement range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- ◆ 10-bit voltage A/D converter can be used for either the battery voltage ( $V_{DD}$ ) or general A/D input ( $V_{AD}$ )
- ◆ 10-bit battery current A/D converter
- ◆ “Integrated current accumulator” keeps a running total of net current remaining in the battery
- ◆ Elapsed time counter (1-second resolution)
- ◆ 40 bytes of nonvolatile EEPROM for storage of critical battery data
- ◆ 16-pin SSOP (DS2437S) package

1	DQ	$V_{DD}$	14
2	NC	NC	13
3	$V_{AD}$	NC	12
4	NC	X1	11
5	VSNS+	NC	10
6	VSNS+	X2	11
7	NC	NC	10
8	AGND	GND	9

**DS2437S**  
16-pin SSOP

# Featured Products

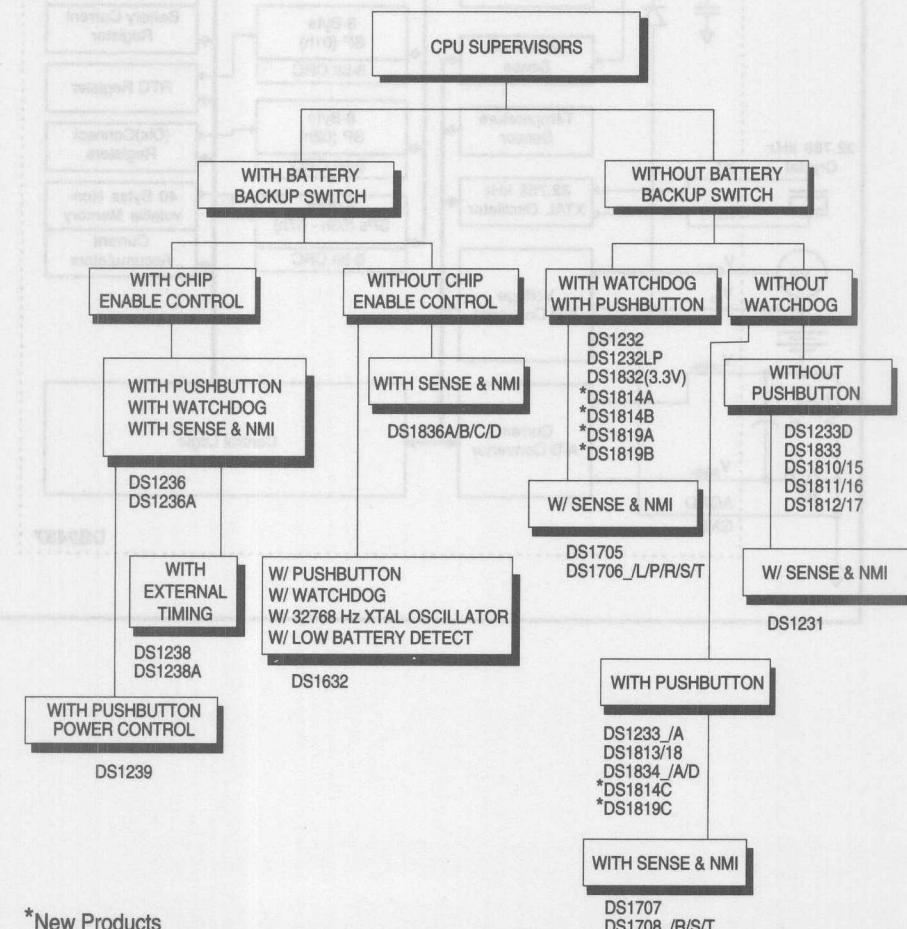
## DS2437 Block Diagram



# CPU Supervisors

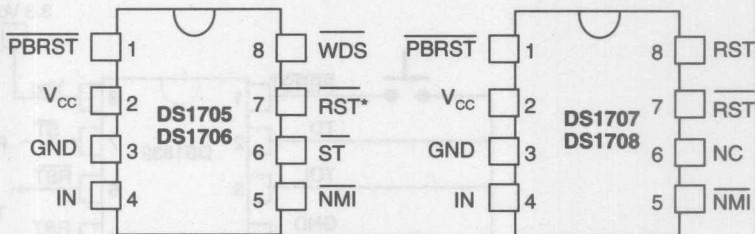
The defining feature of the CPU Supervisor family is a power monitor reset with a timed output guaranteeing stable, predictable operation during power transitions. These devices give systems (*i.e.*, power supplies and microprocessors) time to stabilize prior to starting normal operation. They also stop microprocessors as power degrades to protect valuable nonvolatile memory.

Dallas Semiconductor's CPU Supervisors provide the advantage of a digital output to alert systems of critical analog power conditions. They improve reliability, simplify design, and minimize the number of discrete components required to perform vital power monitoring. They also provide more complex system monitoring functions with features such as watchdogs, pushbutton resets, and chip enable controls.



# Featured Products

The DS170x MicroMonitors are pin- and function-compatible with the Maxim MAX705, MAX706x, MAX707, and MAX 708x family of µP supervisory circuits. The devices are designed specifically for power-sensitive designs and have a low 60 µA quiescent current maximum specification.



## DS1705, DS1706x, DS1707, & DS1708x MicroMonitors

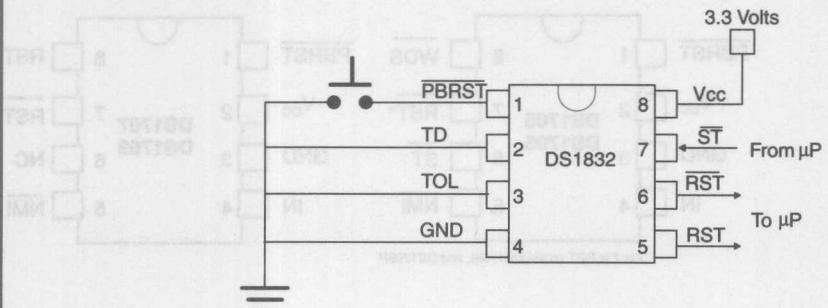
- ◆ Active high and active low CMOS reset outputs
- ◆ 5% or 10% 5V tolerances
- ◆ 5%, 10%, and 20% 3.3V tolerances
- ◆ Watchdog (DS1705 & DS1706x only)
- ◆ Debounced pushbutton reset
- ◆ Low 60 µA quiescent current maximum
- ◆ All devices are spec'd at -40° to +85° C

## Applications

- ◆ Virtually any 5V, 3.3V or 3.0V µP-based system
- ◆ Existing MAX705, MAX706x, MAX707, and MAX 708x, or MAX813L applications

# Featured Products

The DS1832 3.3-Volt MicroMonitor is pin- and function-compatible with the industry-standard DS1232 MicroMonitor chip. The device was designed specifically for 3.3-volt systems. Low power was a key design issue; the device only draws 35  $\mu$ A of quiescent current maximum.



## DS1832 3.3-Volt MicroMonitor

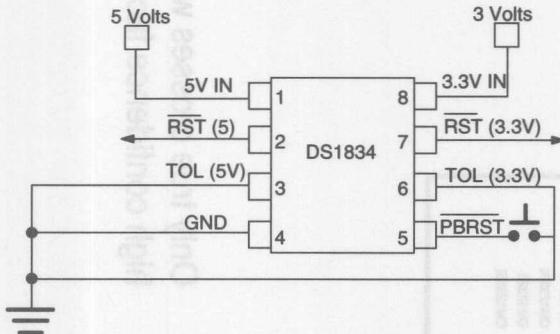
- ◆ Active high and active low CMOS reset outputs
- ◆ 10% or 20% 3.3V, user-selectable voltage tolerances
- ◆ Watchdog with selectable time-out
- ◆ Debounced pushbutton reset
- ◆ Low 35  $\mu$ A quiescent current maximum

## Applications

- ◆ Virtually any 3.3V (or 3.0V) microprocessor-based system
- ◆ Existing DS1232 applications moving to 3.3V

# Featured Products

The DS1834 monitors two supply voltages; a 3-volt supply and 5-volt supply, at the same time. Power is supplied from the higher of the two voltage inputs. Low power and versatility make the DS1834 ideal for many applications using 5 and 3 volts.



## DS1834 Dual EconoReset with Pushbutton

- ◆ Dual voltage monitoring
- ◆ Selectable tolerances of 5V (5% or 10%) and 3.3V (10% or 20%)
- ◆ 3 output options: open drain active low, push/pull active low, and push/pull active high
- ◆ Pushbutton/manual reset input
- ◆ Low quiescent current of 50 $\mu$ A maximum

## Applications

- ◆ Virtually any system making use of 5 volts and 3 volts
- ◆ PC/PCI motherboards and cards
- ◆ Network hubs and routers

# CPU Supervisor and Nonvolatile Controller Cross Reference

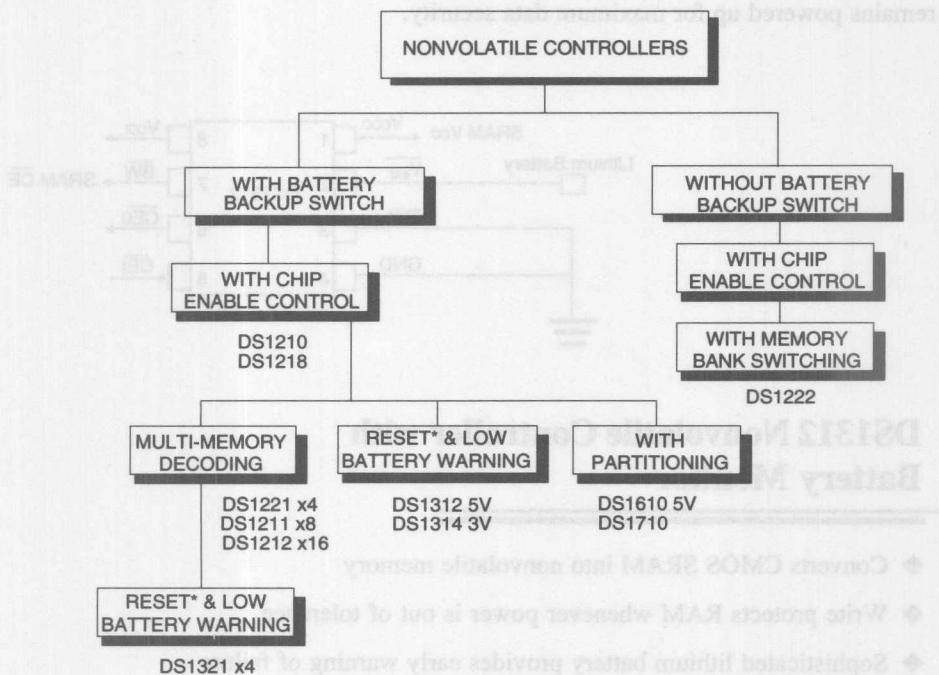
Dallas Semi	Maxim	Linear Tech	Telecom	Analog Dev.	California Micro	Crystal Semi	Benchmark
DS1210	MXD1210CPA				CM1210P	CS1232-CP	bq2201PN
DS1210N	MXD1210NPA				CM1210PI	CS1232-IP	bq2201PNN
DS1210S					CM1210S	CS1232-CS	
DS1210SN					CM1210SI	CS1232-IS	
DS1221							bq2204PN
DS1221N							bq2204PNN
DS1221S							bq2204SN
DS1221SN							bq2204SNN
DS1232	DS1232LP	MAX1232CPA	LTC1232CN8	TC1232CPA	ADM1232AN	CM1232P	
DS1232N	DS1232LPN	MAX1232EPA	LTC1232IN8	TC1232EPA	ADM1232AN	CM1232PI	
DS1232S	DS1232LPS	MAX1232CWA			ADM1232ARW	CM1232S	
DS1232SN	DS1232LPSN	MAX1232EWA			ADM1232ARW	CM1232SI	
DS1232LPS-2		MAX1232CSA	LTC1232CS8	TC1232COA	ADM1232ARN		
DS1232LPSN-2		MAX1232ESA	LTC1232IS8	TC1232EOA	ADM1232ARN		
DS1232LPU					ADM1232ARM		
DS1705EPA	MAX705xPA				ADM705AN		
DS1705ESA	MAX705xSA				ADM705AR		
DS1706EPA	MAX706xPA				ADM706AN		
DS1706ESA	MAX706xSA				ADM706AR		
DS1706LEPA	MAX813LxEPA				ADM706PAN		
DS1706LESA	MAX813LxESA				ADM706PAR		
DS1706PEPA	MAX706PxPA				ADM706RAN		
DS1706PESA	MAX706PxSA				ADM706RAR		
DS1706REPA	MAX706RxPA				ADM706SAN		
DS1706RESA	MAX706RxSA				ADM706SAR		
DS1706SEPA	MAX706SxPA				ADM706TAN		
DS1706SESA	MAX706SxSA				ADM706TAR		
DS1706TEPA	MAX706TxPA				ADM707AN		
DS1706TESA	MAX706TxSA				ADM707AR		
DS1707EPA	MAX707xPA				ADM708AN		
DS1707ESA	MAX707xSA				ADM708AR		
DS1708EPA	MAX708xPA				ADM708RAN		
DS1708ESA	MAX708xSA				ADM708RAR		
DS1708REPA	MAX708RxPA				ADM708SAN		
DS1708RESA	MAX708RxSA				ADM708SAR		
DS1708SEPA	MAX708SxPA				ADM708TAN		
DS1708SESA	MAX708SxSA				ADM708TAR		
DS1708TEPA	MAX708TxPA						
DS1708TESA	MAX708TxSA						
DS1810-5				TC54VC4812T			
DS1810-10				TC54VC4512T			
DS1810-15				TC54VC4412T			
DS1815-10				TC54VC2812T			
DS1815-20				TC54VC2512T			

\*x can be a "C" or "E"

Only true crosses with a high confidence factor.

# Nonvolatile Controllers

Nonvolatile Controllers switch power between a primary supply and a secondary supply to allow SRAMs to maintain memory even in the absence of primary power. These devices also control chip enable to protect the SRAM from spurious writes when power is out of tolerance.

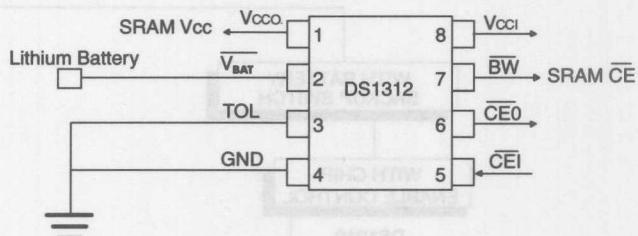


\* 16- and 20-pin versions

The products above are tested and meet the same stringent requirements as those controllers used in Dallas Semiconductor's Nonvolatile SRAMs. This provides designers with a known quality level and the option to customize the RAM or battery to meet special design requirements.

## Featured Product

The DS1312 Nonvolatile Controller monitors a 5-volt supply and switches to a 3-volt lithium cell if  $V_{CC}$  drops below 2.7 volts. It also controls the chip enable to an SRAM to guarantee data protection when  $V_{CC}$  drops out of tolerance. On power-up, a load is placed on the lithium battery and the battery voltage is checked. If the battery level is low, a battery warning output is pulled active. The battery is rechecked every 24 hours that  $V_{CC}$  remains powered up for maximum data security.



# DS1312 Nonvolatile Controller with Battery Monitor

- ◆ Converts CMOS SRAM into nonvolatile memory
  - ◆ Write protects RAM whenever power is out of tolerance
  - ◆ Sophisticated lithium battery provides early warning of failure
  - ◆ Maximum  $V_{CC}$  quiescent current  $400\mu A$
  - ◆ Extremely low quiescent current of less than  $100nA$  maximum during battery backup

## Applications

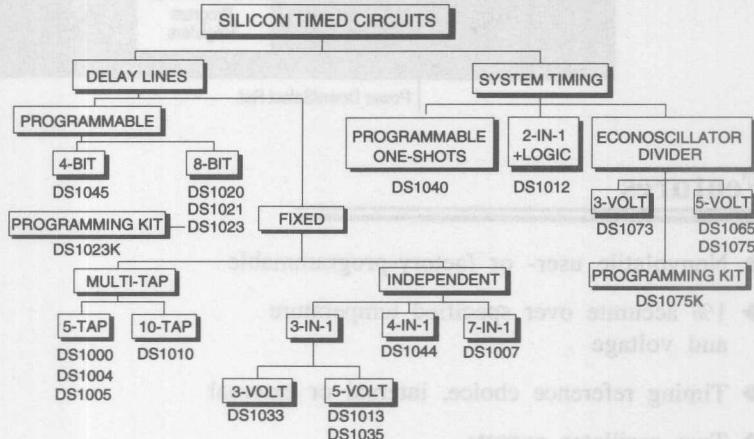
- ◆ Industrial controllers
  - ◆ Medical equipment
  - ◆ Data logging equipment
  - ◆ Network hubs and routers

# Silicon Timed Circuits

Fixed delay lines are the core of the Silicon Timed Circuits family. These are all-silicon replacements for hybrid delay lines. The all-silicon delay lines offer a number of advantages over hybrid components:

- ◆ Increased reliability
- ◆ Smaller packaging (including DIP and SOIC)
- ◆ Standard IC handling (e.g., solder reflow)

The basic delay line IC technology allows functionality to be added to these devices. Examples include programmable delay lines, one-shots and delay lines combined with logic. These devices find applications in all market segments, especially computer, telecommunications, and industrial.

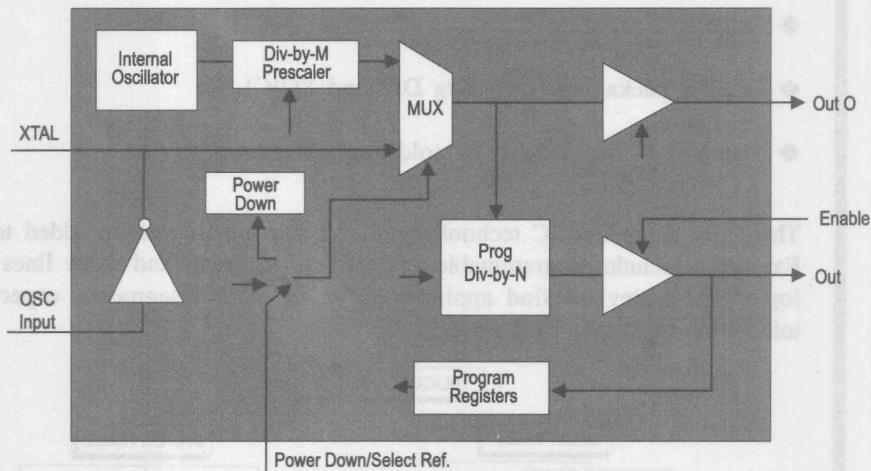


## Applications

- ◆ Microprocessor and memory clock timing generation
- ◆ Optical networks
- ◆ Recovery of asynchronous data signals
- ◆ Laser and ultrasound control
- ◆ Overcoming timing mismatches between components
- ◆ Skew correction

# Featured Product

## DS1073/DS1075 EconOscillator Functional Block Diagram



### Features

- ◆ Nonvolatile user- or factory-programmable
- ◆ 1% accurate over specified temperature and voltage
- ◆ Timing reference choice, internal or external
- ◆ Two oscillator outputs
- ◆ 3V or 5V devices available

### Applications

- ◆ System Clock: no external components required
- ◆ Fixed frequency master oscillator: factory set at 60, 66, 80 or 100 MHz
- ◆ Programmable oscillator: 30 kHz to 100 MHz

# Cross References

Data Delay Part No.	Dallas Semiconductor Suggested Replacement
DDU-3J-5xxx	DS1000-xxx
DDU-4C-5xxx	DS1000K-xxx
DDU-4F-5xxx	DS1000K-xxx
DDU-6-xxx	DS1000K-xxx
DDU-66-xxx	DS1000K-xxx
DDU-66-xxxA	DS1000G-xxx
DDU-66C-xxx	DS1000K-xxx
DDU-66F-xxx	DS1000K-xxx
DDU-66F-xxxA	DS1000G-xxx
DDU-7F-xxx	DS1010-xxx
DDU-7J-xxx	DS1010-xxx
DDU-8C-xxx	DS1000M-xxx
DDU-8F-5xxx	DS1000M-xxx
MDU-3C-xxx	DS1013K-xxx
MDU-3F-xxx	DS1013K-xxx
MDU-4F-xxx	DS1044-xxx
MDU-38F-xxx	DS1013M-xxx, DS1035M-xxx

ESC Part No.	Dallas Semiconductor Suggested Replacement
8SGTxxx	DS1000H-xxx
8T25/8TDxxx	DS1000M-xxx
10SGTxxx	DS1010G-xxx
10T/10TDxxx	DS1010-xxx
14CMTDxxx	DS1000-xxx, DS1000K-xxx
14FP/14FPDxxx	DS1013K-xxx
14FT/14FTDxxx	DS1000-xxx
14HLT/14HTLDxxx	DS1000K-xxx
14HT/14HTDxxx	DS1000K-xxx
14LTDxxx	DS1000-xxx
14P/14PDxxx	DS1013K-xxx
14PL/14LPDxxx	DS1013K-xxx
14SGPxxx	DS1013G-xxx
14SGTxxx	DS1000G-xxx
14T/14LTxxx	DS1000K-xxx
14TDxxx	DS1000-xxx
14TDL/14LTDxxx	DS1000K-xxx

Belfuse Part No.	Dallas Semiconductor Suggested Replacement
A423-0xxx-02	DS1000H-xxx
A447-0xxx-A1	DS1000K-xxx
A447-0xxx-A3	DS1013K-xxx
A447-0xxx-02	DS1000K-xxx
A447-0xxx-09	DS1000K-xxx
A447-0xxx-10	DS1010-xxx
A463-0xxx-02	DS1000M-xxx
0447-0xxx-02	DS1000K-xxx
0450-0xxx-02	DS1000K-xxx
S422-0xxx-10	DS1010G-xxx
S423-0xxx-02	DS1000H-xxx

Rhombus Part No.	Dallas Semiconductor Suggested Replacement
AI3D-xxx	DS1013K-xx
AI3D-xxG	DS1013G-xx
AIDL-xxx	DS1000K-xxx(C)
AIDL-xxxG	DS1000G-xxx(C)
AIDM-xxx	DS1000K-xxx
AIDM-xxxG	DS1000G-xxx
AITD-xxx	DS1010-xxx
AITD-xxxG	DS1010G-xxx
AMDL-xxx	DS1000M-xxx
AMDL-xxxG	DS1000H-xxx
AMDM-xxx	DS1000M-xxx
AMDM-xxxG	DS1000H-xxx
D2TZMI-xxx	DS1010-xxx
DTZMI-xxx	DS1000K-xxx
FDM-xxx	DS1000M-xxx
FSDM-xxx	DS1000Q-xxx(C)
MSDM-xxx	DS1013K-xx
SDM-xxx	DS1000M-xxx

(C) = Custom Delay

Consult individual data sheets for exact matches of delay timing and/or packaging.

For cross references to part numbers not listed, please contact the factory at (972) 371-4348 or fax us at (972) 371-3717.

# Cross References

Datatronics Part No.	Dallas Semiconductor Suggested Replacement
DL106x, 107x	DS1000M-yyy
DL610x, 611x	DS1000K-yyy
DL613x, 614x	DS1013K-yyy
DL620x	DS1000C-yyy(C)
DL622x, 623x	DS1000K-yyy
DL628x	DS1010-yyy
DL630x, 631x	DS1000K-yyy
DL633x, 634x	DS1000Q-yyy(C)
DL635x, 637x, 638x	DS1000K-yyy
DL651x, 652x, 658x	DS1000K-yyy
DL67xx	DS1010-yyy
SM61xx	DS1010G-yyy

Kappa Part No.	Dallas Semiconductor Suggested Replacement
DL14CBxxx	DS1000K-yyy
DL15CCxxx	DS1010-yyy
DL34CBxxx	DS1013-yyy
DT08CBxxx	DS1000M-yyy
DT13CBxxx	DS1000Q-yyy(C)
DT14CBxxx	DS1000K-yyy
DT15CCxxx	DS1010-yyy
DT16CBxxx	DS1000-yyy(C)
DT34CBxxx	DS1013K-yyy
DT38CBxxx	DS1013M-yyy
HCL14CBxxx	DS1000K-yyy
HCT14CBxxx	DS1000K-yyy
LD14CBxxx	DS1000K-yyy
LDS14CBxxx	DS1000K-yyy
LDS34CBxxx	DS1013-yyy
LS14CBxxx	DS1000K-yyy
LT14CBxxx	DS1000K-yyy
SMT08CBxxx	DS1000H-yyy
SMT14CBxxx	DS1000G-yyy
SMT44CBxxx	DS1044G-yyy

(C) = Custom Delay

Consult individual data sheets for exact matches of delay timing and/or packaging.

For cross references to part numbers not listed, please contact the factory at (972) 371-4348 or fax us at (972) 371-3717.

PCA Part No.	Dallas Semiconductor Suggested Replacement		
EP82xx	DS1000K-yy		
EP83xx	DS1010-yy		
EP87xx	DS1000K-yy		
EP93xx	DS1000K-yy		
xx	yy	xx	yy
00	25	28	101(C)
01	50	29	750(C)
02	100	30	550(C)
03	150	70	50
04	200	71	55(C)
05	250	72	60
06	300(C)	73	65(C)
07	350	74	70(C)
08	400(C)	75	75
09	450	76	80(C)
10	500	77	85(C)
11	60	78	90(C)
13	30	79	95(C)
14	35	80	100
15	40	81	125
16	45	82	150
17	75	83	175
18	420(C)	84	200
19	125	85	225
20	175	86	250
21	225(C)	87	275
22	440(C)	88	300(C)
23	470(C)	89	350
24	600(C)	90	400
25	700(C)	91	450

EP9206-xxx DS1013K-xxx\*

EP9458-xx DS1000M-xx

EP9810-xxx DS1000K-xxx

EPA073-xxx DS1000G-xxx

EPA189-xxx DS1013K-xxx

EPA220-xxx DS1000K-xxx

EPA249-xxx DS1013M-xxx DS1035M-xxx

EPA280-xxx DS1013G-xxx

EPA313-xxx DS1013K-xxx

EPA366-xxx DS1044G-xxx

EPA445-xxx DS1013-xxx

EPA460-xxx DS1010-xxx

EPA810-xxx DS1000Q-xxx(C)

EPA1140-xxx DS1000H-xxx

\*10ns delays and slower. For shorter delays the DS1035M is functionally equivalent, but not pin-compatible.

# Cross References

Pulse Part No.	Dallas Semiconductor Suggested Replacement
2119x, 2121x	DS1000K-yyy
2126x, 2127x	DS1013-yyy
2134x, 2138x	DS1000K-yyy
2141x, 2142x	DS1000-yyy
21468	DS1000K-25
21712	DS1000K-125
21741	DS1000K-60
2178x, 2179x	DS1010-yyy
2181x, 2182x	DS1000K-yyy
2190x, 2191x	DS1000M-yyy
2400x, 2401x	DS1000-yyy
2403x, 2404x	DS1000M-yyy
2403xW, 2404xW	DS1000H-yyy
24048W	DS1000G-75
2405xW, 2406xW	DS1000G-yyy
2411x	DS1010-yyy
2411xW	DS1010G-yyy

Varistor Part No.	Dallas Semiconductor Suggested Replacement
DL1846	DS1000K-175
DL188x	DS1000K-yyy
DL2060	DS1000K-300(C)
DL2061	DS1000K-400(C)
DL2080-2084	DS1000K-yyy
DL2086-2097	DS1000-yyy
DL2171	DS1000K-60
DL218x	DS1010-yyy
DL22xx	DS1013K-yyy
DL2325	DS1013K-65
DL2328	DS1013K-60
DL233x	DS1000K-yyy
DL2349	DS1013K-200
DL235x	DS1013K-yyy
DL2425	DS1013K-12
DL2427	DS1000K-80(C)
DL2437	DS1000K-225(C)
DL244x, DL245x	DS1013K-yyy
DL30xx	DS1000M-yyy
DL315x	DS1010-yyy
DL32xx	DS1013M-yyy, DS1035M-yyy
DL600x, DL601x	DS1000K-yyy
DL604x, DL605x	DS1000M-yyy
DL904x, DL905x	DS1000M-yyy
DL907x, DL908x	DS1000-yyy
SG0xxx	DS1010G-xxx
SG5xxx	DS1000G-xxx
SG904x, SG905x	DS1000H-yyy
SG907x, SG908x	DS1000G-yyy

(C) = Custom Delay

Consult individual data sheets for exact matches of delay timing and/or packaging.

For cross references to part numbers not listed, please contact the factory at (972) 371-4348 or fax us at (972) 371-3717.

# Selection Tables

## Tapped Delay Lines

Part Number	# Taps	Tap 1 Delay (ns)	Tap Increment (ns)	Total Delay (ns)	Supply Voltage (V)	Packages	Applications
DS1000	5	4-100	4-100	20-500	5	8, 14-pin DIP 8-pin SOIC	General Purpose
DS1004	5	5	2,3,4,5	13,17,21,25	5	8-pin DIP, SOIC	General Purpose
DS1005	5	12-50	12-50	60-250	5	8, 14-pin DIP 16-pin SOIC	General Purpose
DS1010	10	5-100	5-100	50-1000	5	14-pin DIP 16-pin SOIC	General Purpose

## Independent Multiple Delay Lines

Part Number	# Delays	Delay Values	Supply Voltage	Packages	Applications
DS1013	3	10-200	5	8, 14-pin DIP 16-pin SOIC	General Purpose
DS1033	3	8-30	3	8-pin DIP, SOIC	3V or Portable Systems
DS1035	3	6-30	5	8-pin DIP, SOIC	General Purpose
DS1044	4	5-25	5	14-pin DIP, SOIC	General Purpose
DS1007	7	3-10,9-40	5	16-pin DIP, SOIC	General Purpose

## Programmable Delays

Part Number	Resolution	Step Zero Delay	Step Sizes (ns)	Max Delay (ns)	Supply Voltage (V)	Packages	Applications
DS1020	8 Bits	10	0.15, 0.25 0.5, 1, 2	48, 74, 138 265, 520	5	16-pin DIP, SOIC	Laser, Optical, Networking, Ultrasonic Control
DS1021	8 Bits	10	0.25, 0.5	74, 138	5	16-pin SOIC	
DS1023	8 Bits	22 Absolute 0 Wt Ref	0.25, 0.5 1, 2, 5	63.75, 127.5 255, 510, 1275	5	16-pin DIP, SOIC	
DS1045	Dual 4-Bit	9	2, 3, 4, 5	39, 54, 69, 84	5	16-pin DIP, SOIC	

## System Timing Functions

Part Number	Description	Timing Range	Packages	Applications
DS1012	2-Input, 4-Output Multiple Delays w/Logic	3-40ns Delays	8-pin DIP, SOIC	Frequency Doubler, General Purpose
DS1040	Programmable 1-Shot	5-500ns Pulse Width	8-pin DIP, SOIC	Pulse Width Modulator, Clock Oscillator

# Selection Tables

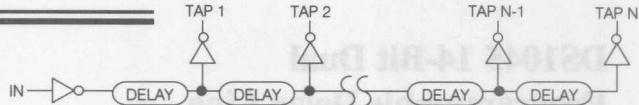
## Programmable Oscillators

Part Number	Description	Timing Range	Packages	Applications
DS1075	EconOscillator/Divider	30 kHz to 100 MHz Fixed Frequency Outputs	8-pin DIP, SOIC	System Clock, Fixed Frequency Oscillator, Programmable Oscillator
DS1075-IND	EconOscillator/Divider	30 kHz to 100 MHz Fixed Frequency Outputs	8-pin DIP, SOIC	Industrial Temperature Applications of ADS1075
DS1065	EconOscillator/Divider	30 kHz to 100 MHz Fixed Frequency Outputs	TO-92	System Clock, Fixed Frequency Oscillator, Programmable Oscillator
DS1073	EconOscillator/Divider	30 kHz to 100 MHz Fixed Frequency Outputs	8-pin DIP, SOIC	3V System Clock, Fixed Frequency Oscillator, Programmable Oscillator
DS1075K	Programming Evaluation Kit	30 kHz to 100 MHz	8-pin DIP, SOIC TO-92	Programming Output Frequency Dividers

## Functional Block Diagrams

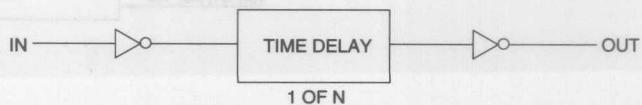
### Multiple Tap Delays:

DS1000; DS1004; DS1005 (N=5);  
DS1010 (N=10)



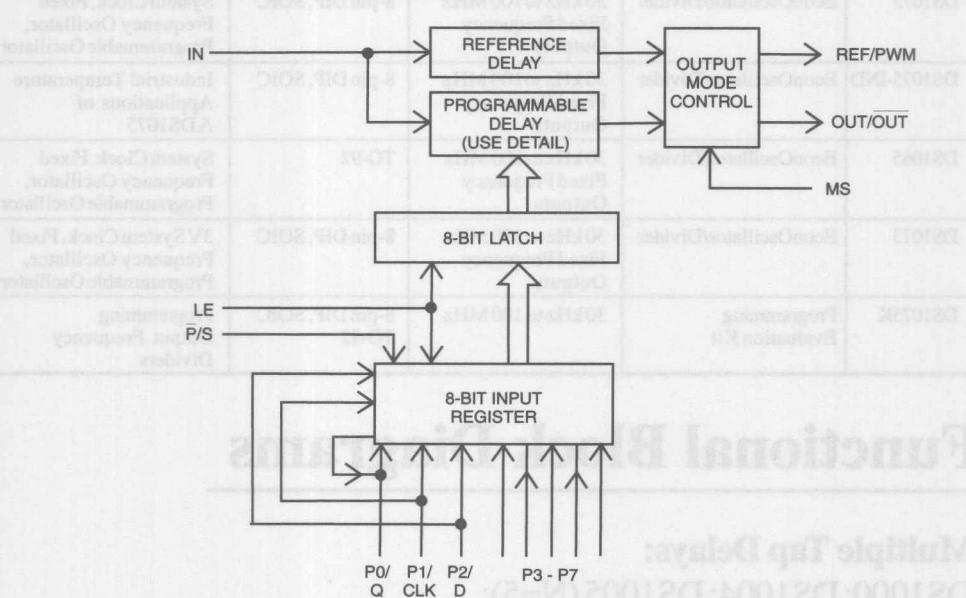
### Multiple Independent Delays:

DS1013; DS1033; DS1035 (N=3);  
DS1044 (N=4); DS1007 (N=7)

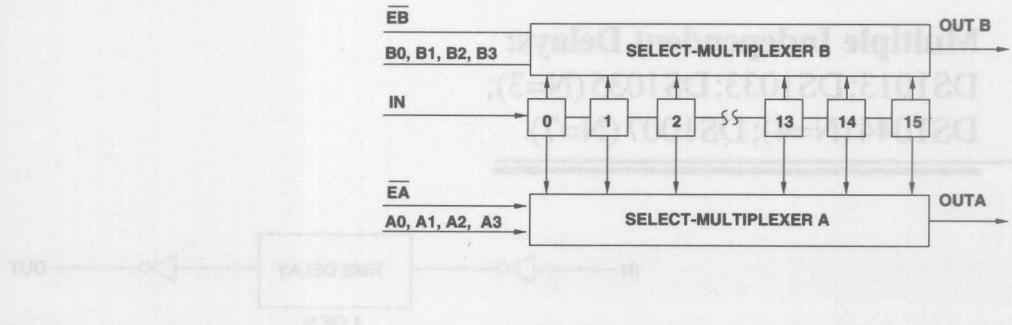


# Functional Block Diagrams

## DS1023 Programmable Delay Line

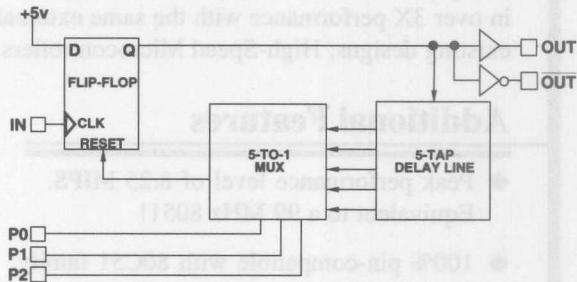


## DS1045 14-Bit Dual Programmable Delay Line



# Functional Block Diagrams

## DS1040 Programmable One-Shot Pulse Generator



# High-Speed Microcontrollers

Dallas Semiconductor's High-Speed Microcontrollers are direct performance upgrades for the 8051, one of the most popular microcontrollers in the world. We recreated the heart of the microprocessor, doing in only 4 clock cycles what has traditionally taken 12 clock cycles. Designed to be drop-in upgrades, the High-Speed Micros' core has been redesigned, resulting in over 3X performance with the same external clock. In addition to increasing the speed of existing designs, High-Speed Microcontrollers boast a top external clock speed of 33 MHz.

## Additional Features

- ◆ Peak performance level of 8.25 MIPS.  
Equivalent to a 99 MHz 8051!
- ◆ 100% pin-compatible with 80C51 family.  
Drop-in replacement means direct upgrade path for existing designs.
- ◆ 100% binary compatible with 80C51 family. Existing compiled code runs with no modification.
- ◆ 100% compatible with existing 80C51 software tools. Compatible with existing high-level language software tools.

## Why Upgrade?

### ◆ 16-bit performance at an 8-bit price

You don't have to redesign around an expensive 16-bit processor for high-performance designs. The increased speed of the High-Speed Microcontroller family means that you can get the performance you need without paying for what you don't need.

### ◆ Reduce power without sacrificing performance

Because the High-Speed Microcontroller is more efficient than a traditional 8051, the crystal speed and power consumption can be reduced without sacrificing performance. In addition, many devices incorporate power-saving features, such as new low-power modes and a low-current ring oscillator.

### ◆ Upgrade your software, not your hardware

New software features can be accommodated without a costly redesign of the system hardware, getting you to market faster and allowing room for future expansion.

### ◆ More speed, less EMI

The improved efficiency of the High-Speed Microcontroller dramatically reduces electromagnetic interference (EMI). The EMI reduction mode means that your design won't wreak havoc with nearby electronic systems.

### ◆ Features, Features, Features

Our dual UARTs, watchdog timer, precision reset circuitry, and a host of other features allow you to consolidate your design, saving money, time and PCB real estate.

# Enhanced Feature Set

New systems demand not just increased speed, but increased functionality. The High-Speed Microcontroller family incorporates enhanced features and peripherals that simplify circuit design and reduce overall system cost. Some of the features available in High-Speed Microcontrollers include:

- ◆ Up to 14 interrupts, including 6 external
- ◆ Three 16-bit timers
- ◆ 256 bytes scratchpad RAM
- ◆ 1KB on-chip MOVX SRAM
- ◆ 2 data pointers
- ◆ 2 high-speed UARTs
- ◆ Power-fail monitor
- ◆ Precision reset circuitry
- ◆ Watchdog timer
- ◆ Real time clock
- ◆ Nonvolatile SRAM
- ◆ Power management modes
- ◆ Low-power ring oscillator

## Available Options

- ◆ Commercial temperature range 0°C to 70°C
- ◆ Industrial temperature range -40°C to 85°C
- ◆ ROMless
- ◆ EPROM (UV-erasable and One-Time Programmable[OTP])
- ◆ Mask ROM
- ◆ 3V operation

## Applications

Applications for the High-Speed Microcontroller family include any system where high performance and/or low power are important.

- ◆ Telecommunications
- ◆ Industrial controls
- ◆ System supervision
- ◆ Data logging
- ◆ Motor control
- ◆ Hand-held/portable devices

# Featured Products

## DS80C320 Microcontroller

High-Speed Microcontroller upgrade for 80C31/80C32.

- ◆ High-speed core
- ◆ 13 interrupts, including 6 external
- ◆ Three 16-bit timers
- ◆ 256 bytes scratchpad RAM
- ◆ 2 data pointers
- ◆ 2 high-speed UARTs
- ◆ Precision reset circuitry
- ◆ Watchdog timer

## DS87C520 Microcontroller

High-Speed EPROM Microcontroller upgrade for 87C51FX.

- ◆ High-speed core
- ◆ 16KB EPROM
- ◆ 13 interrupts, including 6 external
- ◆ Three 16-bit timers
- ◆ 256 bytes scratchpad RAM
- ◆ 2 data pointers
- ◆ 2 high-speed UARTs
- ◆ Power-fail monitor
- ◆ Precision reset circuitry
- ◆ Watchdog timer
- ◆ 1KB on-chip MOVX SRAM
- ◆ Power management modes

## DS87C530 Microcontroller

The DS87C530 High-Speed EPROM Microcontroller is the first 8051 derivative to incorporate a real time clock. In conjunction with an external lithium power source and watch crystal, this provides the processor direct access to timekeeping registers, eliminating the need for dedicated I/O lines. In addition to 16 Kbytes of EPROM program storage, the on-chip 1KB SRAM is battery backed, providing nonvolatile data storage.

- ◆ High-speed core
- ◆ 14 interrupts, including 6 external
- ◆ Three 16-bit timers
- ◆ 256KB scratchpad RAM
- ◆ 16KB EPROM
- ◆ 1KB on-chip nonvolatile MOVX SRAM
- ◆ 2 data pointers
- ◆ 2 high-speed UARTs
- ◆ Power-fail monitor
- ◆ Precision reset circuitry
- ◆ Watchdog timer
- ◆ Real-time clock
- ◆ Power management modes
- ◆ Low-power ring oscillator

# Featured Products

## DS80C310 Microcontroller

The DS80C310 is a High-Speed Microcontroller upgrade for the 80C31/80C32. It is a reduced feature set version of the DS80C320, designed for cost-sensitive applications.

- ◆ High-speed core
- ◆ 256 bytes scratchpad RAM
- ◆ 10 interrupts, including 6 external
- ◆ 2 data pointers
- ◆ Three 16-bit timers
- ◆ 1 high-speed UART

## DS80C323 Low-Power Microcontroller

The DS80C323 is a low-power version of our popular DS80C320 High-Speed Microcontroller. It operates from 2.7V to 5.5V.

## DS83C520/DS83C530 Microcontrollers

The DS83C520 and DS83C530 are 16KB factory mask ROM versions of our popular DS87C520 and DS87C530 High-Speed Microcontrollers.

## Selection Table

Device	High Speed Core	ROM	RAM	On-chip MOVX SRAM	Serial I/O	Timer Counter	External Interrupts	Power Mgmt. Mode	EMI Reduction Mode	Precision Reset/Power-fail Interrupt	Data Pointers (16-bit)	Real Time Clock	Operating Voltage	Packages
DS80C310	✓	—	256	—	1	3	6				2		4.5V-5.5V	DIP-40 PLCC-44 TQFP-44
DS80C320	✓	—	256	—	2	3+ Watchdog	6			✓	2		4.5V-5.5V	DIP-40 PLCC-44 TQFP-44
DS80C323	✓	—	256	—	2	3+ Watchdog	6			✓	2		2.7V-5.5V	DIP-40 PLCC-44 TQFP-44
DS83C520	✓	16KB Mask ROM	256	1KB	2	3+ Watchdog	6	✓	✓	✓	2		4.5V-5.5V	DIP-40 PLCC-44 TQFP-44
DS83C530	✓	16KB Mask ROM	256	1KB	2	3+ Watchdog	6	✓	✓	✓	2	✓	4.5V-5.5V	PLCC-52 TQFP-52
DS87C520	✓	16KB EPROM	256	1KB	2	3+ Watchdog	6	✓	✓	✓	2	✓	4.5V-5.5V	DIP-40* PLCC-44 TQFP-44
DS87C530	✓	16KB EPROM	256	1KB	2	3+ Watchdog	6	✓	✓	✓	2		4.5V-5.5V	PLCC-52* TQFP-52

\*Also available in windowed version.

# Secure Microcontrollers

The Secure Microcontroller family features 8051-compatible microcontrollers based on nonvolatile RAM rather than ROM for program and data storage. Using NV RAM in a microcontroller provides in-system reprogrammability; software security; and data collection ability. Secure Microcontrollers are available as monolithic microprocessors or as modules that combine the microprocessors, SRAM, and a lithium cell in a single package.

- ◆ Fully 8051-compatible
  - 8051 instruction set
  - Four 8-bit, pseudo-bi-directional I/O ports
  - 128 bytes scratchpad RAM
  - Two 16-bit timer/counters
  - One UART
- ◆ Enhanced features for reliability and ease-of-use
  - Non-multiplexed, bytewide address/data bus for memory access
  - Nonvolatile SRAM control guaranteed for 10+ years of data retention (with appropriate battery RAM)
  - Partitioned code and data segments
  - Power-fail reset/power-fail interrupt
  - Precision watchdog timer
  - ROM-based serial bootstrap loader allows in-system reprogramming
- ◆ Optional features in various family members include
  - Firmware security
  - Real-time clock
  - Random number generator
  - CRC hardware for checking memory validity
  - 8042-style reprogrammable peripheral controller (RPC) mode
- ◆ Modules guarantee 10+ years of data retention in the absence of external power

# Featured Products

## DS5000FP Soft Microprocessor Chip

The DS5000FP is the original Soft Microprocessor Chip in an 80-pin QFP (Quad Flat Pack). It adds the following to the basic family features described above:

- ◆ Nonvolatile control for 8K x 8 or 32K x 8 SRAMs
- ◆ Partitions one SRAM into program and data areas, and write protects the program segment
- ◆ Decodes memory for up to two 32K x 8 SRAMs
- ◆ Optional security features
  - Real-time memory encryption
  - 48-bit, user-selected encryption key
  - Security lock destroys memory if unlocked
  - Interrupt vector table hidden on-chip

## DS5000/DS5000T Soft Microcontroller Module

The DS5000 and DS5000T incorporate the DS5000FP, RAM, lithium battery, and an optional real-time clock in a 40-pin DIP module with an 8051 footprint and pinout.

- ◆ Built-in 8KB or 32KB of NV RAM
- ◆ Partitions memory into program and data areas, and write protects the program segment
- ◆ Optional internal real-time clock ("T" option)
- ◆ Incorporates the DS5000FP optional security features

## DS2250/DSS2250T Soft Microcontroller Module

The DS2250 and DS2250T have the identical feature set as the DS5000, but in a SIMM form factor. This package change allows up to 64KB of NV RAM instead of 32KB. The second 32KB of memory is restricted to data memory.

# Featured Products

## DS5001FP 128K Soft Microprocessor Chip

The DS5001FP provides the base feature set of the DS5000FP with the following additions:

- ◆ Accesses up to 128KB on the bytewide bus
- ◆ Decodes memory for 32K x 8 or 128K x 8 SRAMs
- ◆ Four additional decoded peripheral enables
- ◆ CRC hardware for checking program validity
- ◆ 8042-style Reprogrammable Peripheral Controller (RPC) mode
- ◆ Bandgap reference for more accurate power monitoring
- ◆ Note: the DS5001FP has no memory encryption feature

## DS2251T 128K Soft Microcontroller Module

The DS2251T is a 72-pin SIMM based on the DS5001FP. It provides up to 128KB of onboard NV RAM and a real-time clock. The bytewide bus is available at the connector. This is used with the decoded peripheral enables for memory mapped external peripherals such as a UART or A/D converter. The real-time clock has interrupt capability.

# Featured Products

## DS5002FP Secure Microprocessor Chip

The DS5002P is a highly secure version of the DS5001FP. It combines the operating features of the DS5001FP with the following enhancements to the DS5000FP security features:

- ◆ Security is active at all times
- ◆ Improved memory encryption using a 64-bit encryption key
- ◆ Automatic random generation of encryption keys
- ◆ Self-destruct input for tamper protection
- ◆ Die top coating prevents microprobe (DS5002FPM)

## DS2252T Secure Microcontroller Module

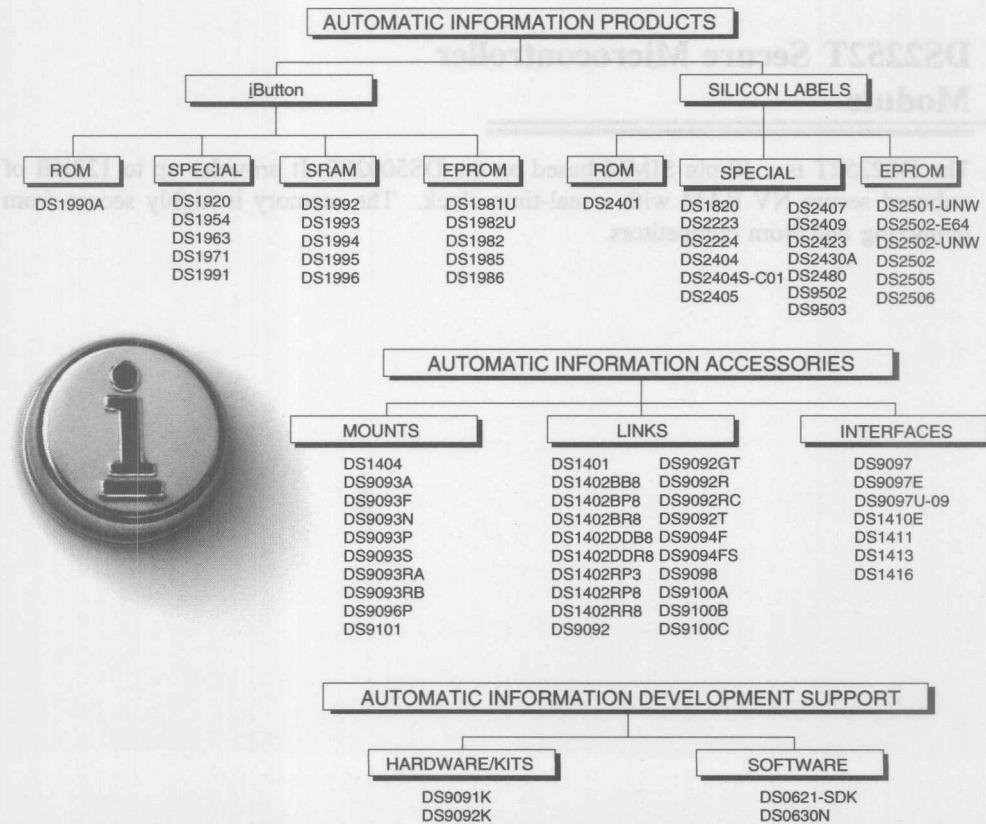
The DS2252T is a 40-pin SIMM based on the DS5002FP. It provides up to 128KB of onboard secure NV RAM with a real-time clock. The memory is highly secure from tampering and from competitors.

# Automatic Information

iButtons™, chips housed in stainless steel cans, are the core of the Automatic Information product line. The MicroCan™ serves two purposes: electrical contact and protection from the environment. Each iButton proves its identity by its unique registration number. The contents of the iButton can be changed while it is attached to an object. Unlike bar codes, iButtons can be read or written without expensive electro-optical equipment. Packaged in solder-mount packages, Automatic Information products function as silicon labels. These devices find applications as re-writeable data carriers in many market segments, such as:

- ◆ Access control
- ◆ Asset management
- ◆ Personal identification
- ◆ Manufacturing
- ◆ Time/attendance control

They also serve as electronic labels storing manufacturing history, revision status and other important information on products to which they are attached.



# Featured Products

## DS1994 Memory Plus Time iButton™

- ◆ Smallest real time clock and memory module with over 10 years of permanent operation
- ◆ Interval timer can automatically accumulate time when power is applied
- ◆ Programmable cycle counter can accumulate the number of system power-on/off cycles
- ◆ Programmable alarms can be set to generate interrupts for interval timer, real time clock and/or cycle counter
- ◆ Write-protect feature provides tamper-proof time data
- ◆ Programmable expiration date limits access to SRAM and timekeeping
- ◆ Clock accuracy is better than  $\pm 2$  minutes/month at 25°C

## Applications

- ◆ Stopwatch, alarm clock, calendar
- ◆ Time and date stamping of events
- ◆ Run time meter (power cycles, hours) for equipment
- ◆ Time-restricted access control
- ◆ Expiration controller for leased equipment
- ◆ Interval timer, event scheduler for maintenance

# Featured Products

## DS1963 4K-Bit Monetary iButton

- ◆ 4096 bits of read/write nonvolatile memory
- ◆ Four 32-bit, read-only, non rolling-over page write cycle counters
- ◆ 32 factory-preset tamper-detect bits to indicate physical intrusion
- ◆ On-chip, 16-bit CRC generator for safeguarding data transfers
- ◆ Overdrive mode boosts communication speed to 142K bits per second
- ◆ Data integrity assured with strict read/write protocols
- ◆ Over 10 years of data retention



## Applications

- ◆ Electronic purse with transaction counter
  - vending machines
  - public transportation systems
  - amusement parks
- ◆ High-security access control
- ◆ Tamper-proof electronic data carrier

# Featured Products

## DS1920 Temperature iButton™

- ◆ Digital thermometer measures temperatures from -55°C to +100°C, typically in 0.2 seconds
- ◆ Accuracy  $\pm 0.5^\circ\text{C}$  within 0°C to +70°C; no calibration or reference required
- ◆ Zero standby power
- ◆ Power supply through data contact
- ◆ Access to internal counters allows increased resolution through interpolation
- ◆ Two bytes of EEPROM for use as alarm triggers or user memory
- ◆ Built-in network controller supports conditional search to directly identify devices sensing alarming temperatures
- ◆ Device-generated 8-bit CRC for on-the-fly data integrity check

## Applications

- ◆ HVAC environmental controls
- ◆ Thermostatic controls
- ◆ Sense temperature in buildings, equipment or machinery
- ◆ In-process thermal monitoring and control
- ◆ Thermodynamic research of temperature profiles
- ◆ Fire alarm and sprinkler systems

## UniqueWare™ Devices

- ◆ 512-bit or 1024-bit 1-Wire™ EPROM is factory-programmed and serialized according to customer-supplied information and then write-protected
- ◆ Dallas Semiconductor handles serialization and bookkeeping for tracking the last number used
- ◆ Up to 57 bytes (512-bit device) or 121 bytes (1024-bit device) of user-defined information, including serialization
- ◆ Customer-specific project ID number together with custom ROM for highest level of product security
- ◆ Programmed devices are made available only to the owner of the project ID or their authorized agents
- ◆ Minimum order size 1000 pieces; no NRE charge, short lead-time
- ◆ Wide operating voltage range (2.8V to 6.0V) and industrial temperature range (-40°C to +85°C)
- ◆ Available as DS2501-UNW (512-bit) or DS2502-UNW (1024-bit) Silicon Label and DS1981U (512-bit) or DS1982U (1024-bit) UniqueWare iButton

## Applications

- ◆ After-market protection of products by restricted availability
- ◆ Node ID for network cards (IEEE-assigned number)
- ◆ Wireless phone ID plus battery information
- ◆ Electronic product identification label with serialization

# Featured Products

## DS2407 Dual Addressable Switch Plus 1Kbit Memory

- ◆ Dual, open-drain PIO read/write channels are remotely controlled over 1-Wire bus
- ◆ Channel A sink capability of 40 mA typically at 0.4V; channel B sink capability of 8 mA at 0.4V
- ◆ Maximum operating voltage of 13V at PIO-A, 6.5V at PIO-B
- ◆ Activity latch with each channel to capture short pulses
- ◆ 1024 bits user-programmable OTP EPROM
- ◆ Operates over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C
- ◆ Supports conditional search with user-programmable condition
- ◆ Low cost TO-92 (Channel A only) or 6-pin TSOC surface mount package

## Applications

- ◆ Automation in homes, laboratories or factories
- ◆ Burglar alarms
- ◆ Irrigation controls
- ◆ Greenhouses
- ◆ Vending machines

# Featured Products

## DS2480 Serial 1-Wire™ Line Driver

- ◆ Common-ground serial port to 1-Wire line driver communicates with all iButtons and 1-Wire chips
- ◆ Self-calibrating time base generates the correct 1-Wire timing for regular and overdrive 1-Wire speed independently of program execution or CPU speed
- ◆ Interfaces directly to the UART of a microprocessor
- ◆ Compatible with all serial ports that support 9.6 kbps
- ◆ Can be set to 19.2 kbps, 57.6 kbps and 115.2 kbps under software control
- ◆ Generates 12V EPROM programming pulse and stiff 5V pull-up for Crypto iButton, sensors and EEPROMs
- ◆ Compatible with optical, IR, and RF to RS-232 converters
- ◆ Operates over 4.5V to 5.5V from -40°C to +85°C

## Applications

- ◆ Plug-in 1-Wire adapters
- ◆ 1-Wire EPROM programmers
- ◆ Handheld iButton readers
- ◆ MicroLAN 1-Wire networks
- ◆ 1-Wire media jumper for RS232-based systems



# Selection Tables

## iButton™ Family

Part Number	Description	Registration Number	Memory	Micro LAN™	Packages
DS1920	Temperature iButton	8+48+8 Bits ROM	16 Bits EEPROM	Yes	F50
DS1954	Crypto iButton	8+48+8 Bits ROM	Secure Coprocessor	Yes	F50
DS1963	Monetary iButton	8+48+8 Bits ROM	4096 Bits NV RAM	Yes	F50
DS1971	EEPROM iButton	8+48+8 Bits ROM	256+64 Bits EEPROM	Yes	F30, F50
DS1981U	UniqueWare iButton	8+48+8 Bits ROM	512 Bits EPROM	Yes	F30, F50
DS1982U	UniqueWare iButton	8+48+8 Bits ROM	1024 Bits EPROM	Yes	F30, F50
DS1982	Add-Only iButton	8+48+8 Bits ROM	1024 Bits EPROM	Yes	F30, F50
DS1985	Add-Only iButton	8+48+8 Bits ROM	16384 Bits EPROM	Yes	F30, F50
DS1986	Add-Only iButton	8+48+8 Bits ROM	65536 Bits EPROM	Yes	F30, F50
DS1990A	Serial Number iButton	8+48+8 Bits ROM	—	Yes	F30, F50
DS1991	MultiKey iButton,	8+48+8 Bits ROM	1344 Bits NV RAM	Yes	F50
DS1992	Memory iButton	8+48+8 Bits ROM	1024 Bits NV RAM	Yes	F50
DS1993	Memory iButton	8+48+8 Bits ROM	4096 Bits NV RAM	Yes	F50
DS1994	Memory + Time iButton	8+48+8 Bits ROM	4096 Bits NV RAM	Yes	F50
DS1995	Memory iButton	8+48+8 Bits ROM	16384 Bits NV RAM	Yes	F50
DS1996	Memory iButton	8+48+8 Bits ROM	65536 Bits NV RAM	Yes	F50

## 1-Wire™ Chips

Part Number	Description	Registration Number	Memory	Micro-LAN™	Packages*
DS1820	1-Wire Thermometer	8+48+8 Bits ROM	16 Bits EEPROM	Yes	1, 2
DS2223	EconoRAM	—	256 Bits RAM	No	3, 4
DS2224	EconoRAM + ROM	32 Bits ROM	224 Bits RAM	No	3, 4
DS2401	Silicon Serial Number	8+48+8 Bits ROM		Yes	3, 4, 5
DS2404	EconoRAM + Time	8+48+8 Bits ROM	4096 Bits RAM	Yes	2, 6, 7
DS2404S-C01	Dual-port Mem.+Time	8+48+8 Bits ROM	4096 Bits RAM	Yes	7
DS2405	Addressable Switch	8+48+8 Bits ROM	—	Yes	3, 4, 5
DS2407	Dual Addressable Switch + Memory	8+48+8 Bits ROM	1024 Bits EPROM	Yes	3, 5
DS2409	MicroLAN Coupler	8+48+8 Bits ROM	—	Yes	5
DS2423	1-Wire RAM+counter	8+48+8 Bits ROM	4096 Bits RAM	Yes	5
DS2430A	1-Wire EEPROM	8+48+8 Bits ROM	256+64 Bits EEPROM	Yes	3, 5
DS2480	1-Wire Line Driver			—	8
DS2501-UNW	Uniqueware	8+48+8 Bits ROM	512 Bits EPROM	Yes	3, 5, 8
DS2502-UNW	Uniqueware	8+48+8 Bits ROM	1024 Bits EPROM	Yes	3, 5, 8
DS2502-E64	IEEE EUI-64 Address	8+48+8 Bits ROM	1024 Bits EPROM	Yes	3, 5
DS2502	Add-only Memory	8+48+8 Bits ROM	1024 Bits EPROM	Yes	3, 5, 8
DS2505	Add-only Memory	8+48+8 Bits ROM	16384 Bits EPROM	Yes	3, 5

# Selection Tables

## 1-Wire™ Chips (continued)

Part Number	Description	Registration Number	Memory	Micro-LAN™	Packages*
DS2506	Add-only Memory	8+48+8 Bits ROM	65536 Bits EPROM	Yes	1,9
DS9502	ESD Protection Diode	—	—	—	5
DS9503	ESD Diode w/resistor	—	—	—	5

\*1: PR-35

2: SSOP

3: TO-92

4: SOT-223

5: 6-pin TSOC

6: 16-pin DIP

7: 16-pin SOIC

8: 8-pin SOIC, 150 mil

9: 8-pin SOIC, 208 mil

## Accessories

Part Number	Category	Description
DS1404	Mount	Touch and Hold Probe Cable Cradle
DS9093A	Mount	Angled Snap-In Fob For F5 MicroCan
DS9093F	Mount	Snap-In Fob For Flanged MicroCan
DS9093N	Mount	Angled Fob For Flanged MicroCan
DS9093P	Mount	Permanent Mount For F5 MicroCan, 1 Screw
DS9093S	Mount	Permanent Mount For F5 MicroCan, 2 Screws
DS9093RA	Mount	Lock Ring
DS9093RB	Mount	Flange Enlargement
DS9096P	Mount	Adhesive Pad
DS9101	Mount	Multi-Purpose Clip
DS1401	Link	Front Panel Button Holder
DS1402BB8	Link	Button-To-Button Coiled Cord, 2.4m
DS1402BP8	Link	Button-To-Cup Coiled Cord, 2.4m
DS1402BR8	Link	Button-To-RJ-11 Coiled Cord, 2.4m
DS1402DDB8	Link	Blue Dot Receptor to Button Coiled Cord, 2.4m
DS1402DDR8	Link	Blue Dot Receptor to RJ-11 Coiled Cord, 2.4m
DS1402RP3	Link	RJ-11-To-Cup Coiled Cord, 0.9m
DS1402RP8	Link	Button-To-Cup Coiled Cord, 2.4m
DS1402RR8	Link	RJ-To-RJ-11 Coiled Cord, 2.4m
DS9092	Link	Panel-Mount Probe
DS9092GT	Link	Hand-Grip Probe With Tactile Feedback
DS9092R	Link	iButton Port, Tabbed MicroCan
DS9092R-C	Link	iButton Port, Tabbed MicroCan With Logo
DS9092T	Link	Panel-Mount Probe With Tactile Feedback
DS9094F	Link	Clip For F5 MicroCan, Through-Hole Solder Mount
DS9094FS	Link	Clip For F5 MicroCan For Surface Solder Mount
DS9098	Link	iButton Retainer For Surface Solder Mount
DS9100A	Link	Touch And Hold Probe Stampings, Ground Contact
DS9100B	Link	Touch And Hold Probe Stampings, Data Contact
DS9100C	Link	Touch And Hold Probe Stampings, Data Contact Coiled Spring
DS1410E	Interface	Parallel Port Adapter
DS9097	Interface	COM Port Adapter
DS9097E	Interface	COM Port Adapter, EPROM Upgraded Version

# Selection Tables

## Accessories

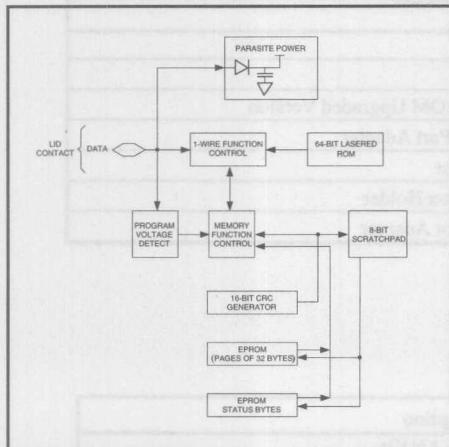
Part Number	Category	Description
DS1410E	Interface	Parallel Port Adapter
DS9097	Interface	COM Port Adapter
DS9097E	Interface	COM Port Adapter, EPROM Upgraded Version
DS9097U-09	Interface	Universal 1-Wire COM Port Adapter
DS1411	Interface	Serial Port iButton Holder
DS1413	Interface	Passive Serial Port iButton Holder
DS1416	Interface	Laptop/Palmtop Blue Dot Adapter

## Development Support

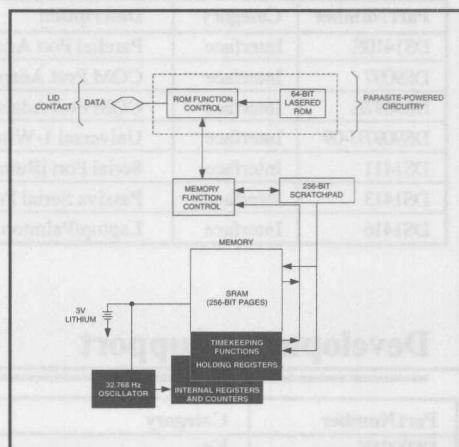
Part Number	Category	Description
DS9091K	Kit	MicroLAN Kit
DS9092K	Kit	iButton Starter Kit
DS0621-SDK	Software	TMEX Professional Software Developer's Kit
DS0630N	Software	TMEX MicroLAN Manager

# Functional Block Diagrams

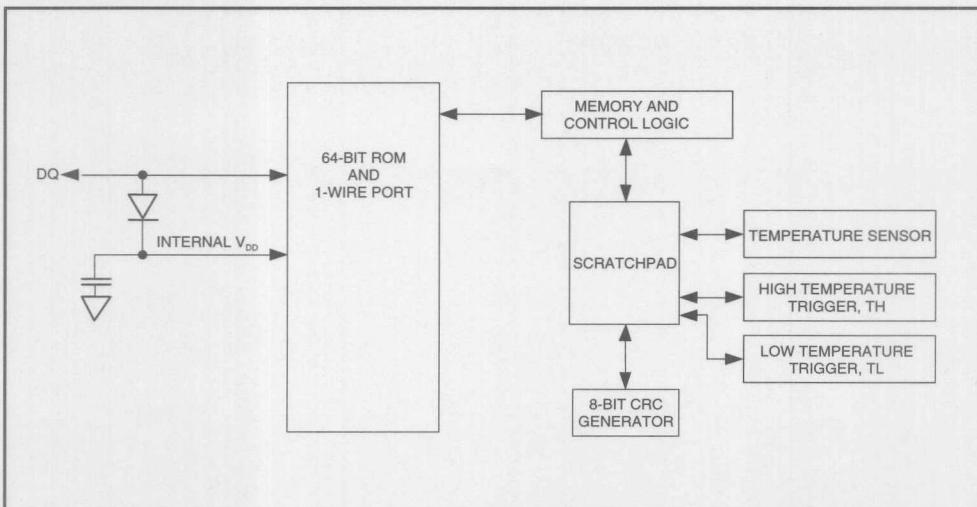
**DS1985/6 Block Diagram**



**DS199x Block Diagram**



**DS1920 Block Diagram**

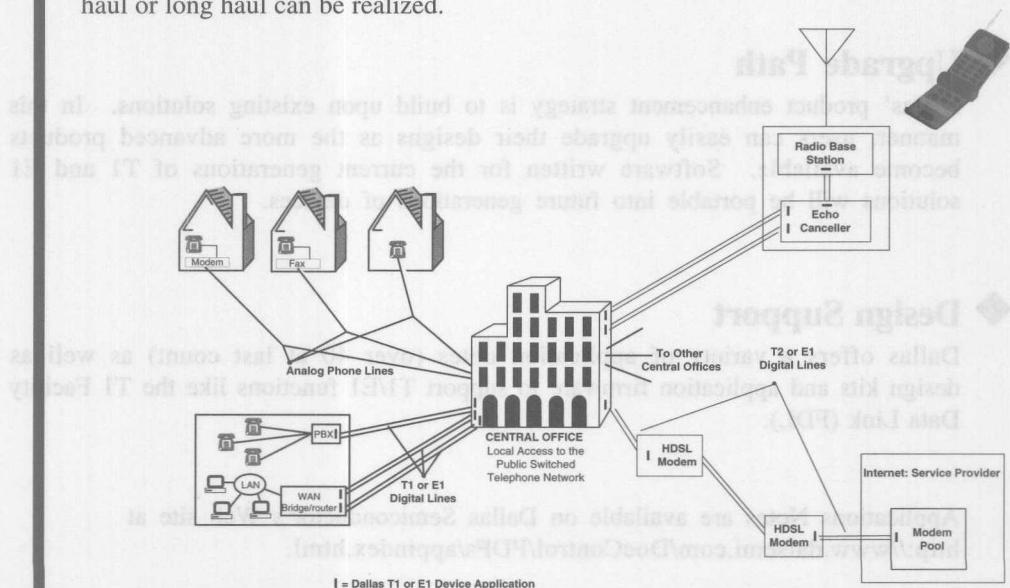


# Telecommunications

T1 and E1 are digital carrier systems deployed over two twisted pairs of wire, operating at 1.544Mbps and 2.048Mbps data rates, respectively. T1 is used predominantly in the United States, Canada, and Japan while E1 is found in all other parts of the world.

## About the T1 and E1 Network

Central Offices (COs) provide connectivity between other COs, Local Exchanges, and their subscribers via the Public Switched Telephone Network. A typical network is shown below in a simplistic diagram identifying a Central Office and its various subscribers. In the diagram, single lines denote analog Plain Old Telephone Service (POTS) lines while double lines denote T1 or E1 digital transmission lines. Line cards are used to terminate these T1/E1 transmission lines and contain the following functions: a line interface, a framer, and an elastic store. The line interface is responsible for transmitting and receiving the pulses which carry user data as well as the transmit or receive clock. The line interface also has a jitter attenuation function used for removing unwanted phase deviations found in the transmit or receive data clock. The framing function identifies individual voice channels or detects and generates alarms and is synchronized to the line interface data and clock. Using a DS2152/54 Single-Chip Transceiver from Dallas Semiconductor along with software and a few passive components, a complete T1 or E1 transmission line card for short haul or long haul can be realized.



A Typical Network

# The T1/E1 Advantage

## ◆ A Decade of Innovative Solutions

Since 1986, Dallas has been introducing innovative solutions for T1 and E1. Dallas was the first in the industry to introduce a line interface that can support both short haul and long haul applications. Dallas was also the first to introduce a combination line interface/framer that supported long haul applications.

## ◆ Most Advanced Products

Dallas offers the most advanced T1 and E1 products available. No other vendor can match Dallas' level of integration and performance. The high level of integration provided in the products eases the task of the designer; the extensive feature sets of the products ensure that they fit all applications.

## ◆ Standard Compliance

Dallas T1 and E1 products are designed to meet the latest ANSI, AT&T, ETSI, and ITU (CCITT) standards. To ensure compliance, Dallas has independent testing labs verify the performance of the products.

## ◆ Upgrade Path

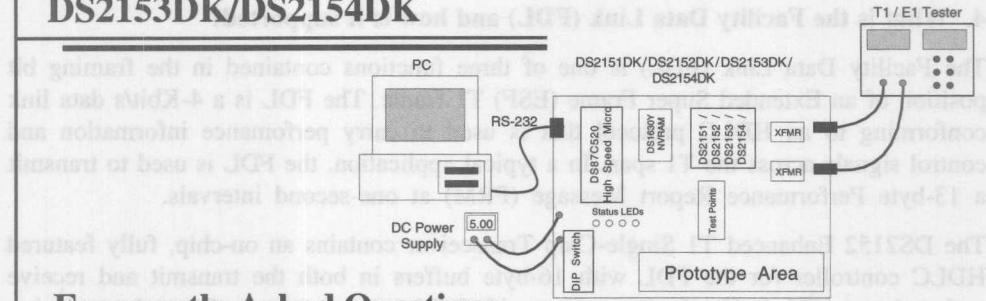
Dallas' product enhancement strategy is to build upon existing solutions. In this manner, users can easily upgrade their designs as the more advanced products become available. Software written for the current generations of T1 and E1 solutions will be portable into future generations of devices.

## ◆ Design Support

Dallas offers a variety of application notes (over 40 at last count) as well as design kits and application firmware to support T1/E1 functions like the T1 Facility Data Link (FDL).

Applications Notes are available on Dallas Semiconductor's Web site at  
<http://www.dalsemi.com/DocControl/PDFs/appindex.html>.

## Single-Chip Transceiver Design Kits DS2151DK/DS2152DK/ DS2153DK/DS2154DK



### Frequently Asked Questions

#### 1. Why offer T1 and E1 in separate chips?

Dallas has always offered both T1 and E1 products in separate pin-for-pin compatible chips. Because the framing algorithms in T1 are quite different from those in E1, they require separate circuitry. Since no application requires performing both T1 and E1 at the same time, the extra circuitry just consumes excess power and adds cost to the design. Since Dallas' chips are pin-for-pin compatible, switching a design from T1 to E1 (or vice versa) requires a simple board stuffing change, normally required anyway to switch out termination resistors and crystals.

#### 2. What is the best approach to a multi-channel design?

At first glance it may appear that a horizontally integrated approach like a Dual or Quad T1/E1 Line Interface or Framer is probably the best fit for a four- or eight-port design, but this is not the case. When you consider the board space requirements and overall system costs, the vertically integrated per-channel approach (like Dallas' Single-Chip Transceivers) is equal to or better than a Dual or Quad solution. The per-channel approach has the added benefits that it can easily be de-populated for a lesser number of ports, and a single point failure will not take out multiple channels. Please contact the factory for a white paper on the subject.

#### 3. What is the advantage of a crystal-less device?

In a traditional T1 and E1 line interface, a pullable crystal has been used for jitter attenuation. The latest generation of Single-Chip Transceivers from Dallas (the DS2152 and DS2154) has crystal-less jitter attenuation, which means that only an accurate T1 or E1 clock source needs to be provided to the device; a pullable crystal is not required. The advantage of the crystal-less design is the savings in board space and cost as well as availability. The pullable crystals are big (larger than even the chips that they support) and they are not available in surface mount. Also, they are not inexpensive (\$3 to \$6 each) and since they are not standard crystals, the lead times can be excessive.

## Frequently Asked Questions, con't.

### **4. What is the Facility Data Link (FDL) and how is it supported?**

The Facility Data Link (FDL) is one of three functions contained in the framing bit position of an Extended Super Frame (ESF) T1 frame. The FDL is a 4-Kbit/s data link conforming to an HDLC protocol that is used to carry performance information and control signals across the T1 span. In a typical application, the FDL is used to transmit a 13-byte Performance Report Message (PRM) at one-second intervals.

The DS2152 Enhanced T1 Single-Chip Transceiver contains an on-chip, fully featured HDLC controller for the FDL with 16-byte buffers in both the transmit and receive paths. Large FDL buffer depth together with full interrupt support allows the servicing microprocessor to transfer data at the message level. The 16-byte buffers allow a complete PRM to be received or loaded for transmission in one step, reducing firmware access to once a second. This greatly reduces real-time servicing and also simplifies the FDL firmware. Example FDL code is available from our FTP site at <ftp://ftp.dalsemi.com/pub/telecom>.

### **5. What is the difference between short haul transmission and long haul transmission?**

T1 transmissions must meet certain pulse template requirements. The two main distinctions which separate long haul and short haul pulse template requirements are the relative shape of the T1 pulse template itself and the location in the transmission path where the pulse template must be met. Long haul transmission (DS1) is used within the telephone network between local offices and from customer premises equipment (CPE) to the local exchange. In a long haul application, a T1 device must meet the T1 pulse template measured differentially at the transmit-side network interface. Long haul pulses are good as far out as 6000 feet. In a short haul application, a T1 device must meet a certain pulse, which is similar to the long haul template for 0dB, measured differentially at the cross-connect point, which is specified from 0 to 655 feet from the transmit-side network interface. In E1, both long haul and short haul pulse templates must be met at the transmit-side network interface. Short haul applications require the pulse template to be compliant with G.703 and can be transmitted over distances with up to 6dB of attenuation. Long haul transmission lengths vary greatly depending on the country. Typical transmission lengths are out as far as -40 to -43dB of attenuation. Dallas Semiconductor Telecom products such as the DS2151, DS2152, DS2153, and DS2154 support short haul and long haul transmission while implementing all of the necessary framing functions. These products, combined with secondary overvoltage protection and termination resistors, offer complete T1 and E1 solutions.

# Applications

## ◆ DS2151, DS2152, DS2153 & DS2154 Single-Chip Transceivers

Dallas Single-Chip Transceivers are recommended for single or multi-port T1/E1 designs requiring a line interface function. Applications include:

Channel Banks	Modem Pools
Channel Service Units (CSU)	Internet Service Access
SLC-96/Digital Loop Carrier (DLC)	Wireless Base Stations
Echo Cancellers	Personal Communications Service (PCS)
Fractional T1/E1 Interfaces	Wide Area Network (WAN)
Multiplexers	ATM/Frame Relay
Private Branch Exchange (PBX)	Primary Rate ISDN
Remote Access	SONET/SDH Add/Drop Multiplexers
Voice Response Systems	Test Equipment
Digital Access and Cross-connect System (DACS)	
High-data-rate Digital Subscriber Line (HDSL)	

## ◆ DS21Q41 & DS21Q43 Quad Framers

The DS21Q41 T1 and DS21Q43 E1 Quad Framers provide high density framer/formatter solutions for applications that do not require a line interface function. Applications include:

T3/E3 Multiplexers	T3/E3 Cross Connects
SONET/SDH Multiplexers	SONET/SDH Cross Connects
Optical Multiplexers	Optical Cross Connects

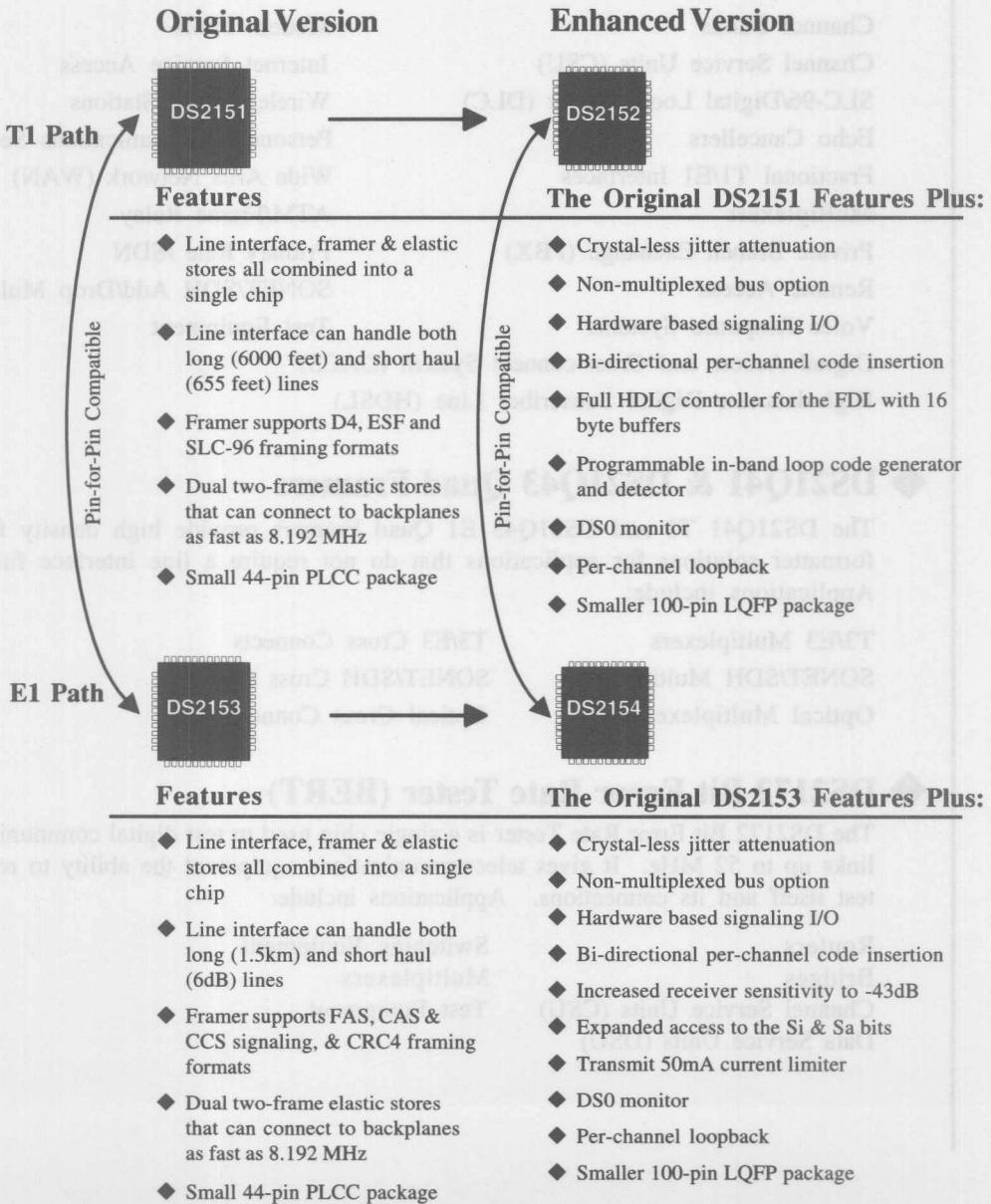
## ◆ DS2172 Bit Error Rate Tester (BERT)

The DS2172 Bit Error Rate Tester is a single chip used to test digital communications links up to 52 MHz. It gives telecommunications equipment the ability to remotely test itself and its connections. Applications include:

Routers	Switching Equipment
Bridges	Multiplexers
Channel Service Units (CSU)	Test Equipment
Data Service Units (DSU)	

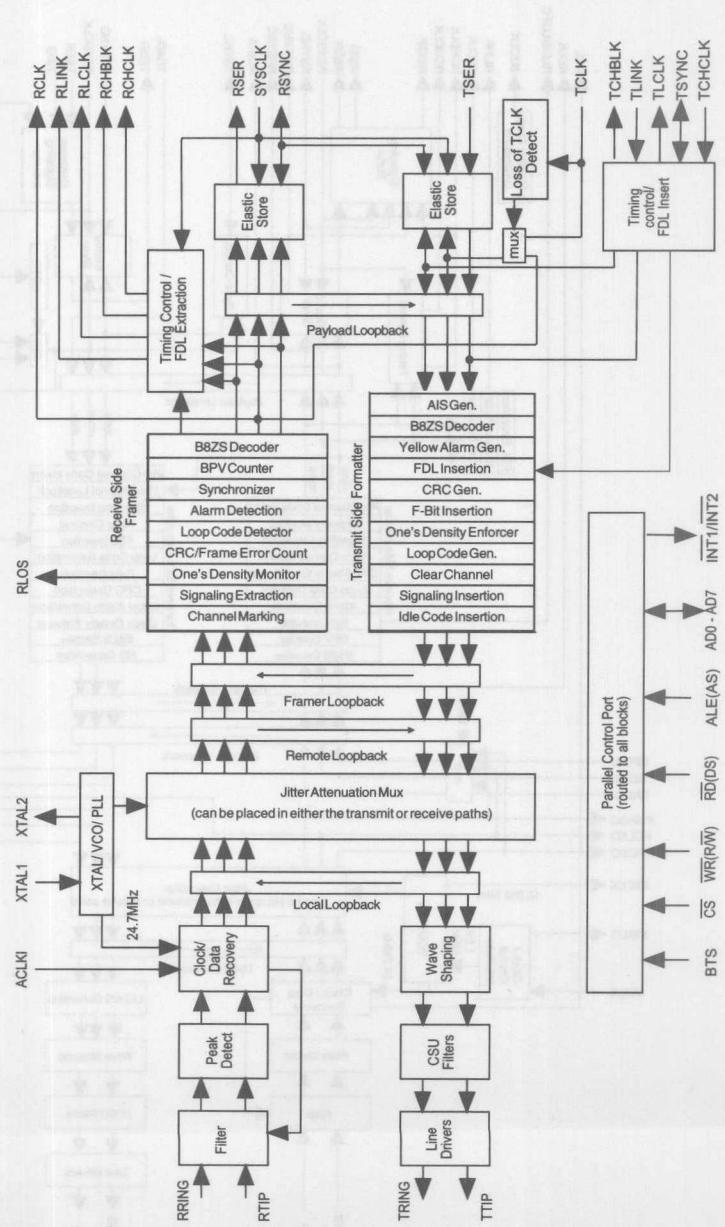
# Featured Products

## Evolution of the Combination Line Interface/Framer Products



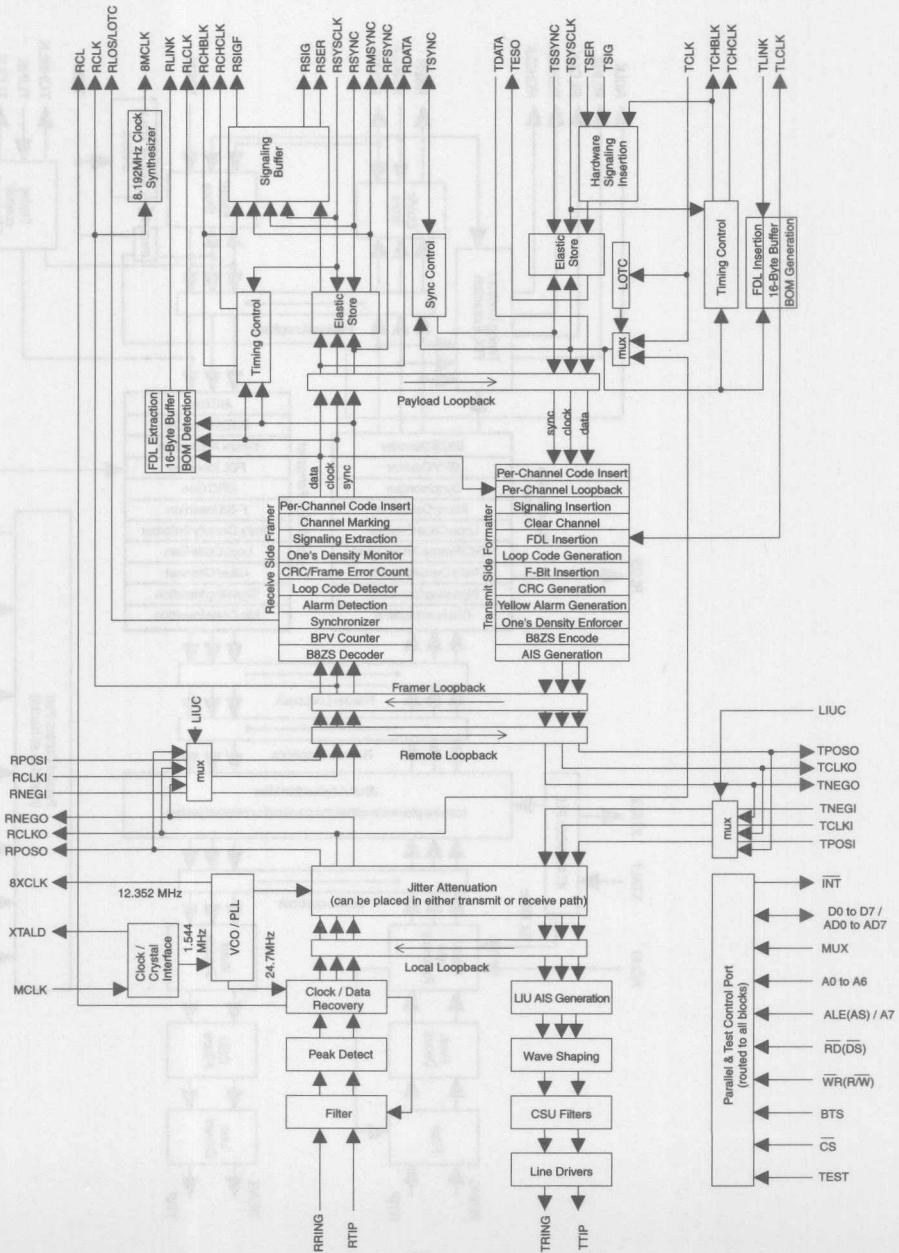
# Featured Products

## DS2151 T1 Single-Chip Transceiver



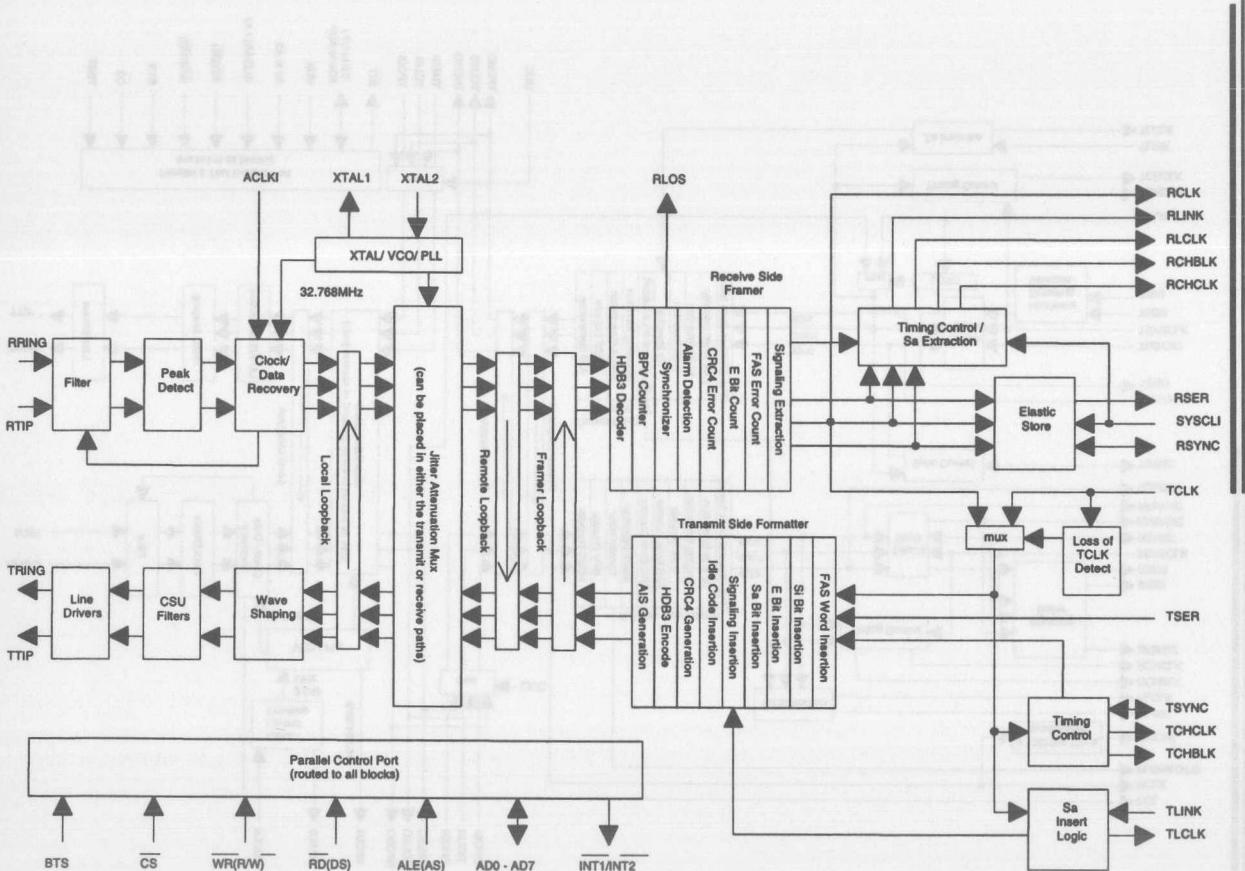
# Featured Products

## DS2152 Enhanced T1 Single-Chip Transceiver



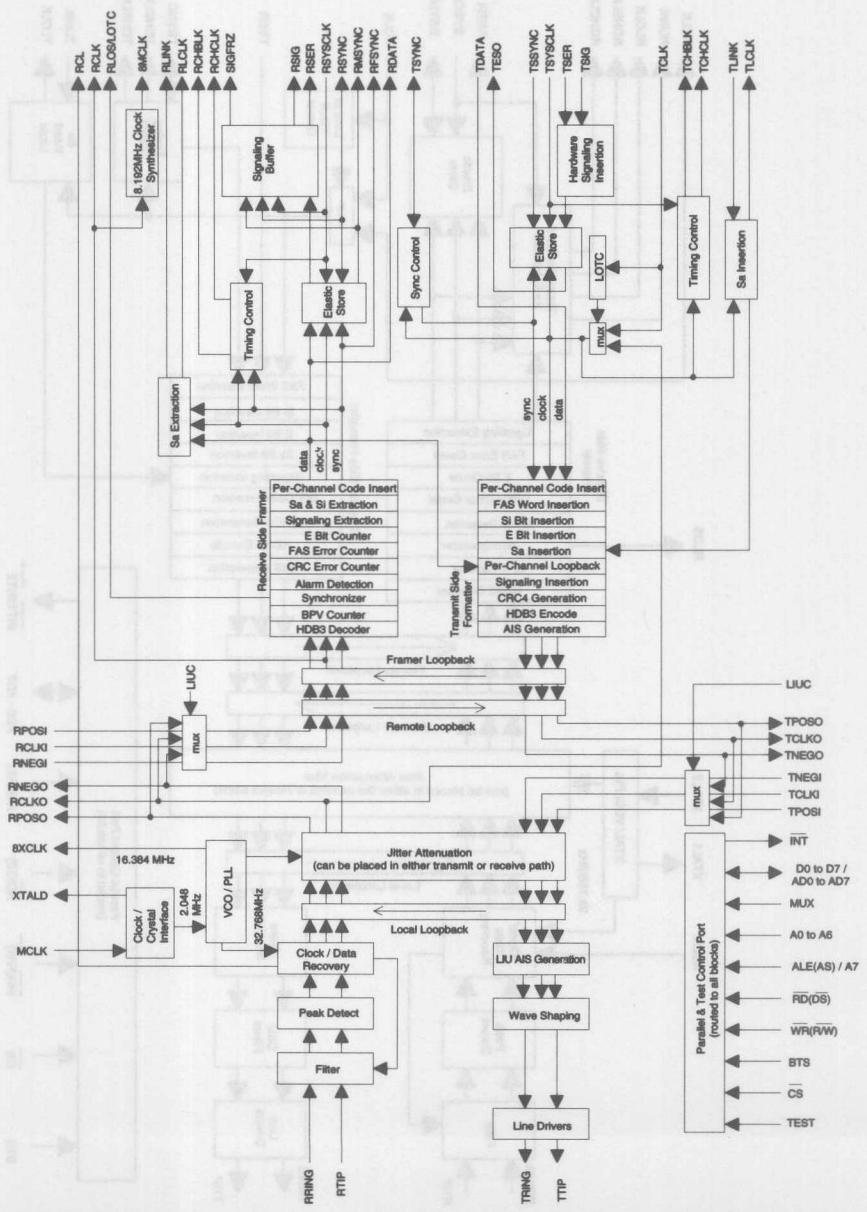
# Featured Products

## DS2153 E1 Single-Chip Transceiver



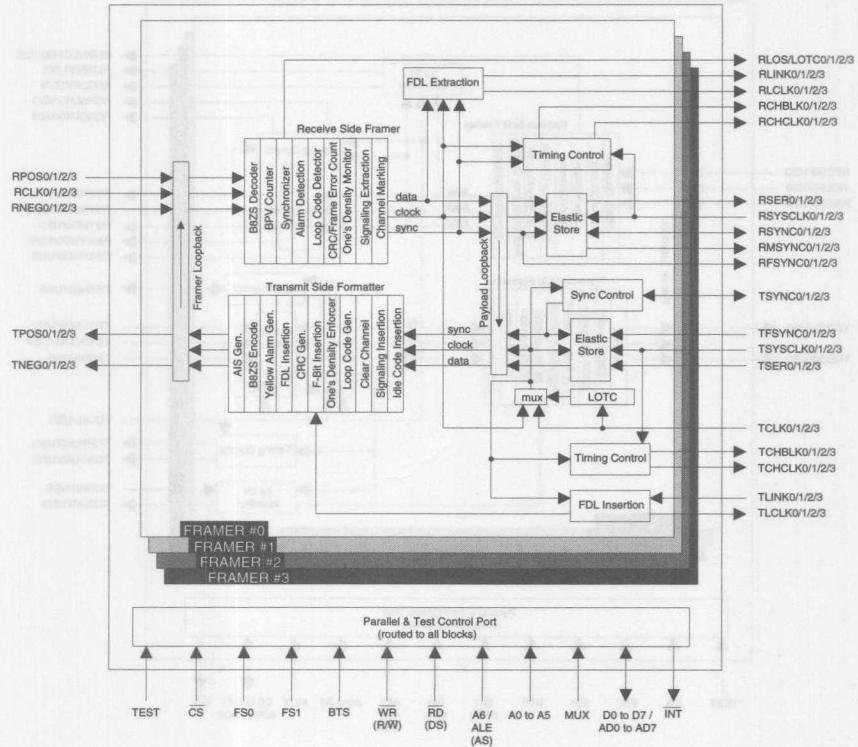
# Featured Products

# **DS2154 Enhanced E1 Single-Chip Transceiver**



# Featured Products

## DS21Q41B Quad T1 Framer

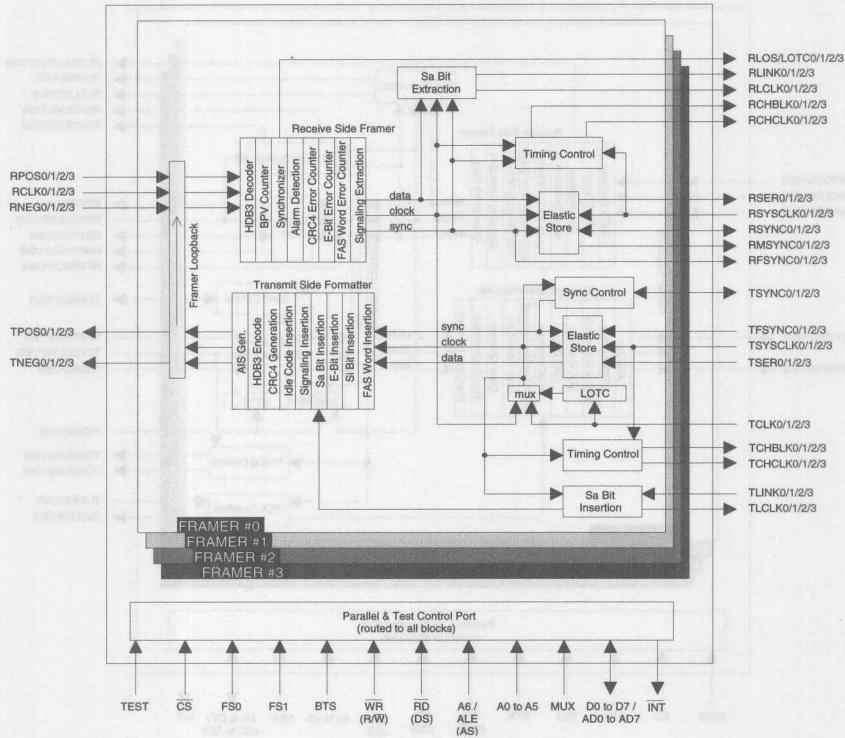


## Features

- ◆ Four completely independent T1 framers on a single monolithic die
- ◆ Small 128-pin TQFP package for minimal footprint
- ◆ Low-power CMOS for minimal power consumption
- ◆ Can directly connect to backplanes with speeds up to 8.192 MHz
- ◆ Pin-for-pin compatible with the DS21Q43A Quad E1 Framer

# Featured Products

## DS21Q43A Quad E1 Framer

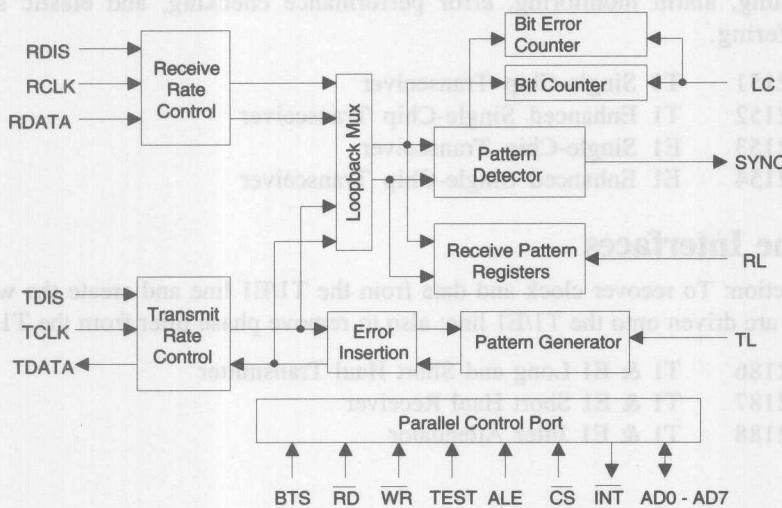


## Features

- ◆ Four completely independent E1 framers on a single monolithic die
- ◆ Small 128-pin TQFP package for minimal footprint
- ◆ Low-power CMOS for minimal power consumption
- ◆ Can directly connect to backplanes with speeds up to 8.192 MHz
- ◆ Pin-for-pin compatible with the DS21Q41B Quad T1 Framer

# Featured Products

## DS2172 Bit Error Rate Tester Chip



## Features

- ◆ Generates and detects digital test patterns for analyzing, evaluating, and troubleshooting digital communications systems
- ◆ Operates up to 52 MHz
- ◆ Can generate and detect both repeating and pseudorandom patterns such as:
  - 1 in 8
  - 3 in 24
  - QRSS (2E20 - 1 with zero restriction)
  - 2E15 - 1
  - 2E32 - 1
  - 2E11 - 1
- ◆ Contains large, onboard 32-bit error counters for minimal processor intervention
- ◆ Small 32-pin TQFP package for minimal footprint

# Selection Guide

## ◆ Combination Line Interface/Framers

Function: Provide complete T1 and E1 interface functionality including clock/data recovery from both long and short haul lines, waveshaping and line driving, framing, alarm monitoring, error performance checking, and elastic store rate buffering.

- DS2151 T1 Single-Chip Transceiver
- DS2152 T1 Enhanced Single-Chip Transceiver
- DS2153 E1 Single-Chip Transceiver
- DS2154 E1 Enhanced Single-Chip Transceiver

## ◆ Line Interfaces

Function: To recover clock and data from the T1/E1 line and create the waveforms that are driven onto the T1/E1 line; also to remove phase jitter from the T1/E1 lines.

- DS2186 T1 & E1 Long and Short Haul Transmitter
- DS2187 T1 & E1 Short Haul Receiver
- DS2188 T1 & E1 Jitter Attenuator

## ◆ Framers

Function: To find the frame, multiframe and channel boundaries in a T1 and E1 data stream and to monitor the T1 and E1 data for errors and alarms.

- DS2141A T1 Controller with Elastic Stores with Parallel Interface
- DS21Q41B Quad Version of the DS2141A
- DS2143 E1 Controller with Elastic Store with Parallel Interface
- DS21Q43A Quad Version of the DS2143
- DS2180A T1 Transceiver with Serial Control Interface
- DS2181A E1 Transceiver with Serial Control Interface
- DS2182 T1 Line Monitor with Serial Control Interface

# Selection Guide

## ◆ Elastic Stores

Function: To absorb the frequency and phase differences between two separate clocks and to rate-convert T1 to E1 and vice versa.

DS2175 T1 and E1 Two-Frame Buffer

DS2176 T1 Receive Elastic Store with Signaling Buffer

## ◆ Bit Error Rate Tester

Function: To generate and synchronize to the standard fixed and pseudorandom test patterns for the purpose of stressing and testing digital communications channels.

DS2172 Bit Error Rate Tester (BERT) Chip

## ◆ ADPCM Voice Compression

Function: To compress and expand digitally-encoded PCM voice signals from 64Kbps down to either 32Kbps, 24Kbps, or 16Kbps.

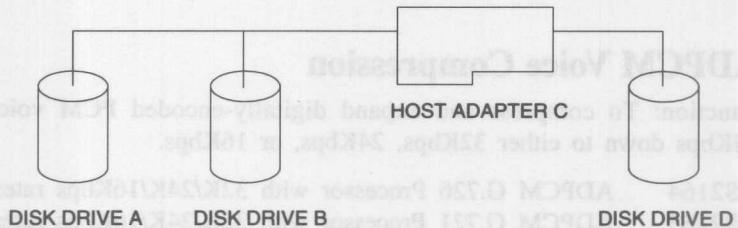
DS2164 ADPCM G.726 Processor with 32K/24K/16Kbps rates

DS2165 ADPCM G.721 Processor with 32K/24K/16Kbps rates

# Termination Products

SCSI, or Small Computer Systems Interface, is an industry standard for high-speed data communication between computer devices. Because of the high speeds associated with SCSI data communications, it is necessary to match the impedance of the computer, disk drive, scanner, or other device to the impedance of the cable linking the devices. Terminators serve this function of matching the impedance and providing the current necessary to drive the bus.

The Termination product family consists of integrated terminator solutions for single-ended SCSI, high voltage differential SCSI, and low voltage differential SCSI. Numerous configurations are provided for the convenience of the designer. Dallas Semiconductor terminators are laser trimmed to the desired impedance, providing the tightest tolerance in the industry. Low capacitance minimizes the load on the bus and allows faster response time.



*The terminators on disk drives A and D are powered on, and the terminators on drive B and host adapter C are powered off. When drive D is removed from the system, the terminator on the host adapter C can be switched on via software or hardware.*

# Featured Products

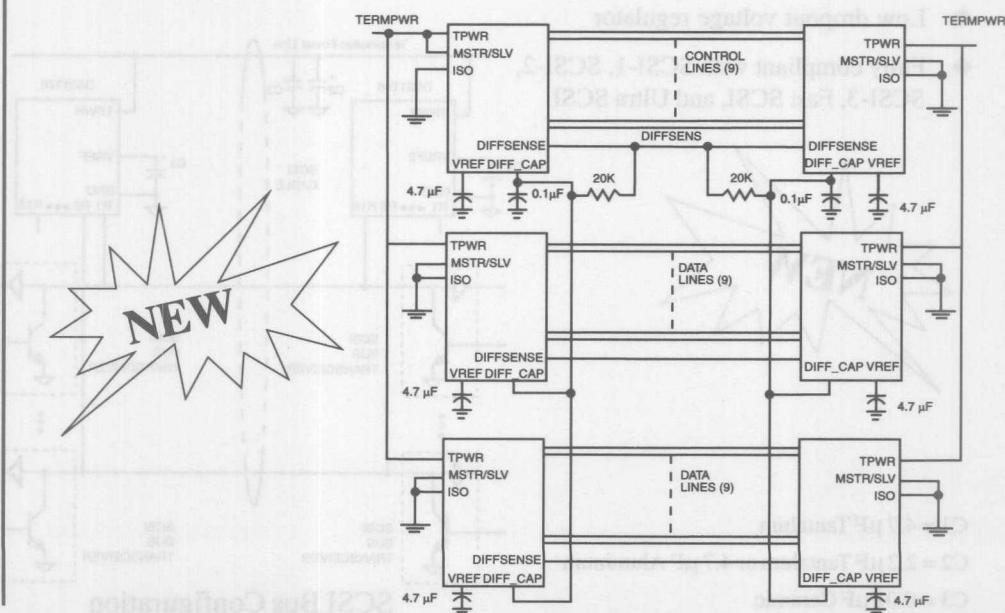
## DS2118M SCSI Terminator

### SE/LVD Multimode

- ◆ Provides multimode low voltage differential/single-ended (LVD/SE) termination for 9 signal line pairs
- ◆ Automatic selection of LVD or SE termination
- ◆ 5% tolerance on SE and LVD termination resistance
- ◆ Low power-down capacitance of 3 pF
- ◆ Fully compliant with Ultra2 SCSI
- ◆ SCSI bus hot plug-compatible
- ◆ Onboard thermal shutdown circuitry
- ◆ Fully supports actively negated SE signals

VREF	1	36	TPWR
NC	2	35	HVD
NC	3	34	LVD
R1P	4	33	SE
R1N	5	32	R8N
R2P	6	31	R8P
R2N	7	30	R8N
HS GND	8	29	R8P
HS GND	9	28	HS GND
HS GND	10	27	HS GND
R3P	11	26	HS GND
R3N	12	25	R7N
R4P	13	24	R7P
R4N	14	23	R6N
R5P	15	22	R6P
R5N	16	21	DIFF_CAP
ISO	17	20	DIFF_SENSE
GND	18	19	MSTR/SLV

DS2118MB  
36-pin SSOP



SCSI Bus Configuration

# Featured Products

## DS21T07 SCSI Terminator

### 9-Line, Single-Ended

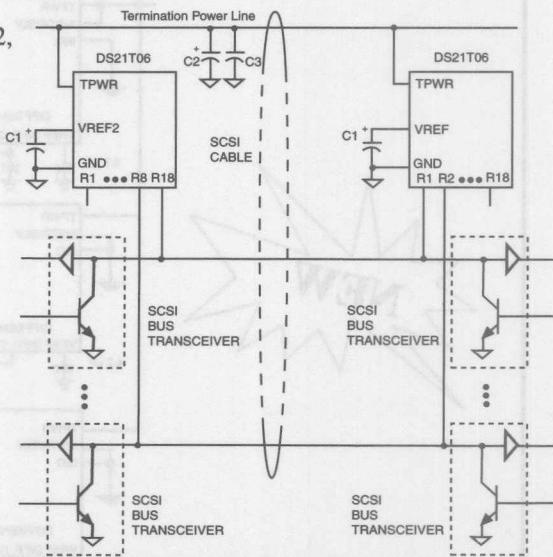
- ◆ Provides active termination for 9 signal lines
- ◆ Laser-trimmed 110-ohm termination resistors have 2% tolerance
- ◆ Backward-compatible (pin-for-pin, drop-in-replacement) for DS21S07A and DS2107
- ◆ Power-down mode isolates termination resistors from the SCSI bus
- ◆ Low power-down capacitance of 3 pF
- ◆ SCSI bus hot plug-compatible
- ◆ Onboard thermal shutdown circuitry
- ◆ Fully supports actively negated SE signals
- ◆ Low dropout voltage regulator
- ◆ Fully compliant with SCSI-1, SCSI-2, SCSI-3, Fast SCSI, and Ultra SCSI



**DS21T07S**  
16-pin SOIC  
(300 mil)



**DS21T07E**  
20-pin TSSOP  
(173 mil)



**SCSI Bus Configuration**

C1 = 4.7  $\mu$ F Tantalum

C2 = 2.2  $\mu$ F Tantalum or 4.7  $\mu$ F Aluminum

C3 = 0.01  $\mu$ F Ceramic

# Featured Products

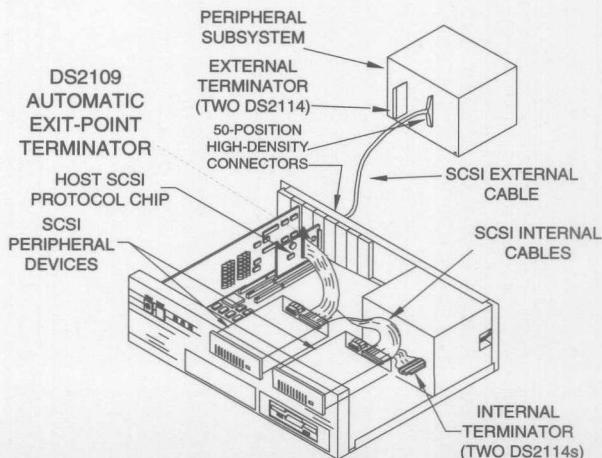
## DS21T09 SCSI Terminator

### 18-Line, Single-Ended, Plug & Play

- ◆ Provides active termination for 18 signal lines
- ◆ Laser trimmed 110-ohm termination resistors have 2% tolerance
- ◆ Backward compatible (pin-for-pin, drop-in-replacement) for DS2109
- ◆ Compatible with Plug & Play SCSI profile
- ◆ Complementary part to DS21T07 for wide SCSI application
- ◆ Low power-down capacitance of 3 pF
- ◆ Bus termination sensing
- ◆ SCSI bus hot plug compatible
- ◆ Onboard thermal shutdown circuitry
- ◆ Fully compliant with SCSI-1, SCSI-2, SCSI-3, Fast SCSI, and Ultra SCSI

PDI	1	28	GND
R1	2	27	R18
R2	3	26	R17
R3	4	25	R16
R4	5	24	R15
R5	6	23	R14
HS GND	7	22	TCS
HS GND	8	21	HS GND
PDO	9	20	PDE
R6	10	19	R13
R7	11	18	R12
R8	12	17	R11
R9	13	16	R10
TPWR	14	15	V <sub>REF</sub>

**DS21T09S**  
28-pin SOIC  
(300 mil)



#### ◆ Single-ended SCSI Termination

DS21T07	-	9-line premium
DS21T05	-	9-line economy
DS21T09	-	18-line premium
DS21T06	-	18-line economy
DS21T27	-	27-line termination

#### ◆ High-Voltage Differential SCSI Termination

DS2108 - 9-pair termination

#### ◆ Low-Voltage Differential SCSI Termination

DS2117M - 9-pair, multimode, 36-pin SSOP  
 DS2118M - 9-pair, multimode, 36-pin SSOP  
 DS2119M - 9-pair, multimode, 28-pin TSSOP

# Digital Audio

Digital audio technologies address the digital interface, conversion, feature processing, and control needs for audio signal generation and reception.



A new product line is growing at Dallas Semiconductor to address specific digital audio applications. To accomplish this, we have taken our core expertise in digital, mixed-signal, and DSP technologies and developed additional technologies such as sigma-delta conversion and Universal Serial Bus (USB) communication processing.

The personal computing world is on a path to adopt USB as the interface of choice for low- to medium-speed peripherals, including digital audio components. USB audio brings true plug-and-play operation, hot insertion/removal of peripherals, and higher performance by locating sensitive mixed signal electronics out of the electrically noisy PC.

The first member of a complete USB audio product family, the DS4201 combines sigma-delta D/A conversion techniques with USB interface technologies to provide a unique audio playback function for a variety of USB audio peripherals.

The DS4201 is in production now. Samples, documentation, and an evaluation kit are available from your local sales representative.

# Featured Products

## DS4201 Universal Serial Bus (USB) Audio DAC

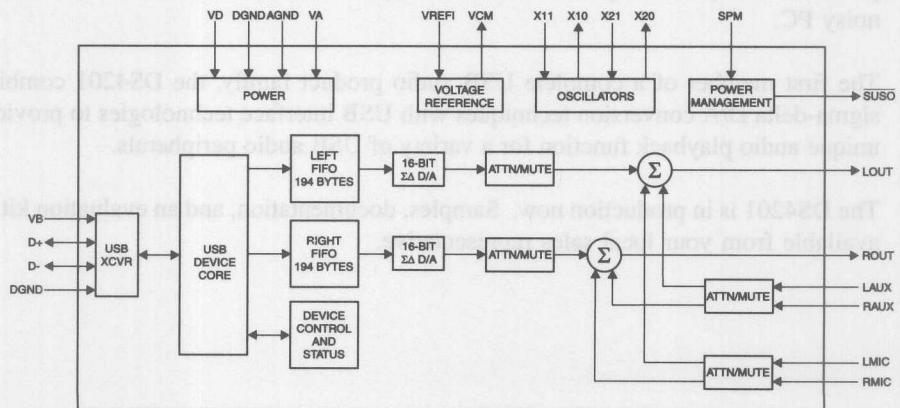
The DS4201 is a single-chip solution for USB-based PC digital audio playback. Primarily used for USB digital speaker applications, the DS4201 integrates a USB device core, 16-bit sigma-delta stereo DAC, and a full-speed USB transceiver. In addition, a USB-controlled analog output mixer is integrated to support analog audio sources.

### Features

- ◆ USB core and audio class-compliant
- ◆ 16-bit stereo Σ-Δ D/A conversion
- ◆ Full-speed (12 Mbps) USB transceiver
- ◆ Analog output mixer for auxiliary inputs
- ◆ Multiple power configurations including USB-powered

### Applications

- ◆ USB digital PC speakers
- ◆ USB-based PC multimedia hardware
- ◆ USB multimedia monitors
- ◆ PC-controlled digital audio playback



# AUTOMATIC INFORMATION iButtons™ 1-Wire™ Chips

## SPECIAL FEATURES

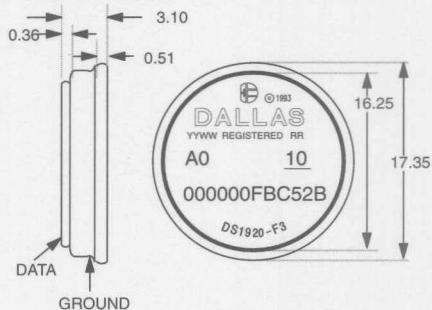
- Digital thermometer measures temperatures from -55°C to +100°C in typically 0.2 seconds
- Accuracy  $\pm 0.5^\circ\text{C}$  within 0°C to +70°C, no calibration or reference required
- Zero standby power
- 0.5°C resolution, digital temperature reading is two's complement of °C value
- Access to internal counters allows increased resolution through interpolation
- Reduces control, address, data, and power to a single data contact
- 8-bit device-generated CRC for data integrity
- 8-bit family code specifies DS1920 communications requirements to reader
- Special command set allows user to skip ROM section and do temperature measurements simultaneously for all devices on the bus
- Two bytes of EEPROM to be used either as alarm triggers or user memory
- Alarm search directly indicates which device senses alarming temperatures

## COMMON iButton FEATURES

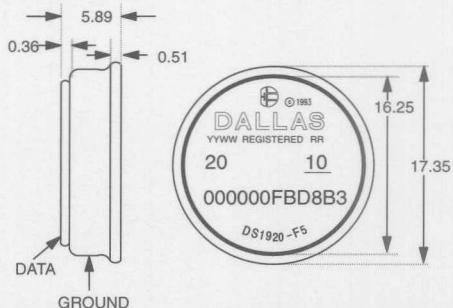
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN<sup>TM</sup>
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire<sup>TM</sup> protocol ensure compatibility with iButton family

- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

### F3 MICROCAN<sup>TM</sup>



### F5 MICROCAN<sup>TM</sup>



All dimensions are shown in millimeters.

**DALLAS**  
SEMICONDUCTOR

# DS1962/DS1963

## 1K-Bit/4K-Bit Monetary iButton™

### SPECIAL FEATURES

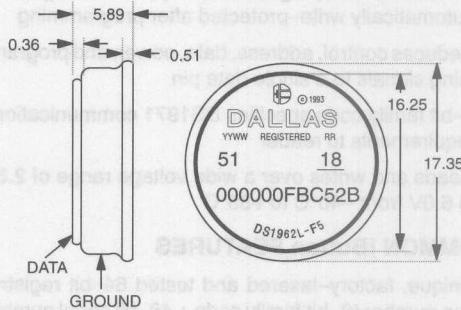
- 4096 bits of read/write nonvolatile memory (DS1963), 1024 bits with the DS1962
- Overdrive mode boosts communication speed to 142k bits per second
- 256-bit scratchpad ensures integrity of data transfer
- Memory partitioned into 256-bit pages for packetizing data
- Data integrity assured with strict read/write protocols
- Four 32-bit read-only non rolling-over page write cycle counters (DS1963), three page write cycle counters with the DS1962
- 32 factory-preset tamper-detect bits to indicate physical intrusion
- On-chip 16-bit CRC generator for safeguarding data transfers
- Operating temperature range from -40°C to +70°C
- Over 10 years of data retention

### COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Can be accessed while affixed to object
- Economically communicates to host with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire™ protocol ensure compatibility with iButton Device family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage

- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

### F5 MICROCANTM



### ORDERING INFORMATION

DS1962L-F5	F5 MicroCan
DS1963L-F5	F5 MicroCan

### EXAMPLES OF ACCESSORIES

DS9096P	Self-Stick Adhesive Pad
DS9101	Multi-Purpose Clip
DS9093RA	Mounting Lock Ring
DS9093F	Snap-In Fob
DS9092	iButton Probe

### iButton DESCRIPTION

The DS1962/DS1963 Monetary iButton (hereafter referred to as DS196X) is a rugged read/write data carrier that acts as a localized database that can be easily accessed with minimal hardware. The nonvolatile memory offers a simple solution to storing and retrieving information pertaining to the object to which the iButton is associated. Data is transferred serially via the 1-Wire protocol which requires only a single data lead and a ground return.



# DS1971 256-Bit EEPROM iButton™

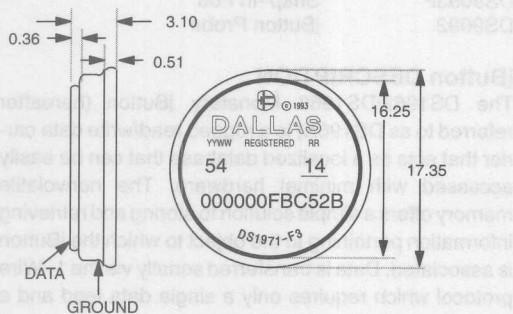
## SPECIAL FEATURES

- 256-bits Electrically Erasable Programmable Read Only Memory (EEPROM) communicates with the economy of one signal plus ground
- EEPROM organized as one 256-bit page
- 64-bit one-time programmable application register is automatically write-protected after programming
- Reduces control, address, data, power, and programming signals to a single data pin
- 8-bit family code specifies DS1971 communications requirements to reader
- Reads and writes over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C

## COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for Microlan™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information

## F3 MICROCAN™



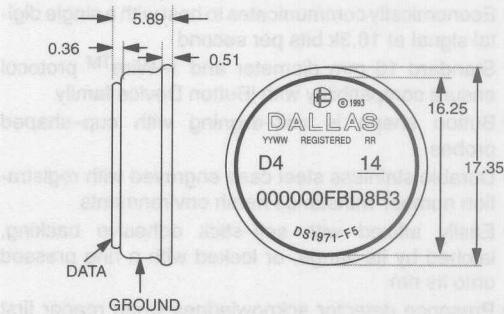
All dimensions shown in millimeters.

- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

## ORDERING INFORMATION

DS1971-F3	F3 MicroCan
DS1971-F5	F5 MicroCan

## F5 MICROCAN™



**DALLAS**  
SEMICONDUCTOR

**DS1973**  
4K-Bit EEPROM iButton™

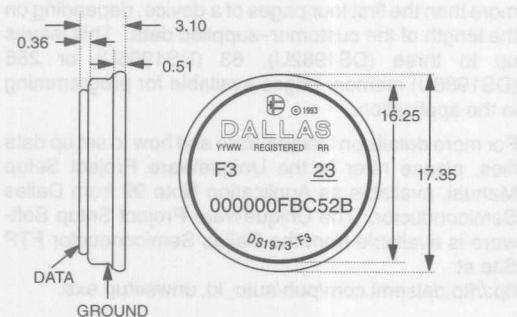
### SPECIAL FEATURES

- 4096 bits Electrically Erasable Programmable Read Only Memory (EEPROM)
- Overdrive mode boosts communication speed to 142k bits per second
- 256-bit scratchpad ensures integrity of data transfer
- Memory partitioned into 256-bit pages for packetizing data
- Reduces control, address, data and power to a single data pin
- 8-bit family code specifies DS1973 communication requirements to reader
- Reads and writes over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C

### COMMON iButton FEATURES

- Unique, factorylasered and tested 64bit registration number (8bit family code + 48bit serial number + 8bit CRC tester) assures absolute identity because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact

### F3 MICROCAN™



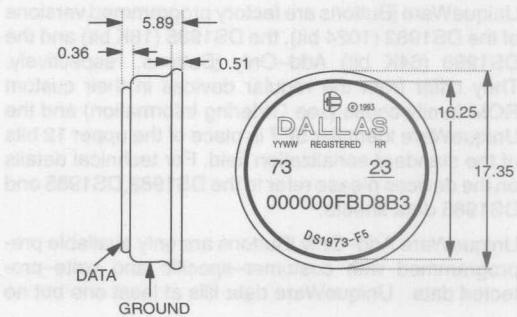
All dimensions shown in millimeters.

- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire™ protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

### ORDERING INFORMATION

DS1973-F3	F3 MicroCan
DS1973-F5	F5 MicroCan

### F5 MICROCAN™



## SPECIAL FEATURES

- 1024 bits, 16K bits or 64K bits Electrically Programmable Read Only Memory (EPROM) communicates with the economy of one signal plus ground
- Unique, factory lasered and tested 64-bit registration number (8-bit family code, 36-bit serialization, 12-bit UniqueWare Identifier 5E7H, 8-bit CRC tester) assures absolute traceability because no two parts are alike.
- EPROM partitioned into 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Reduces control, address, data, power and programming signals to a single pin
- 8-bit family code specifies device communications requirements to reader
- Presence detector acknowledges when reader first applies voltage
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C

## iButton DESCRIPTION

UniqueWare iButtons are factory programmed versions of the DS1982 (1024 bit), the DS1985 (16K bit) and the DS1986 (64K bit) Add-Only iButtons, respectively. They differ from the regular devices in their custom ROM family codes (see Ordering Information) and the UniqueWare Identifier 5E7 in place of the upper 12 bits of the standard serialization field. For technical details on the devices please refer to the DS1982, DS1985 and DS1986 data sheets.

UniqueWare Add-Only iButtons are only available pre-programmed with customer-specific and write-protected data. UniqueWare data fills at least one but no

## COMMON iBUTTON FEATURES

- Multidrop controller for MicroLAN
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire protocol ensure compatibility with iButton family
- Button Shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

more than the first four pages of a device, depending on the length of the customer-supplied data. This leaves up to three (DS1982U), 63 (DS1985U) or 255 (DS1986U) memory pages available for programming in the application.

For more details on UniqueWare and how to set up data files, please refer to the UniqueWare Project Setup Manual, available as Application Note 99 from Dallas Semiconductor. The UniqueWare Project Setup Software is available from the Dallas Semiconductor FTP Site at [ftp://ftp.dalsemi.com/pub/auto\\_id/unwsetup.exe](http://ftp.dalsemi.com/pub/auto_id/unwsetup.exe).

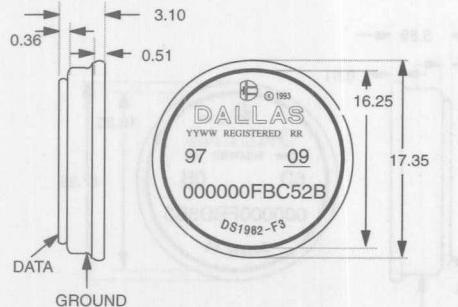


## DS1982 1Kbit Add-Only iButton™

### SPECIAL FEATURES

- 1024 bits Electrically Programmable Read Only Memory (EPROM) communicates with the economy of one signal plus ground
- EPROM partitioned into four 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Architecture allows software to patch data by superseding an old page in favor of a newly programmed page
- Reduces control, address, data, power, and programming signals to a single data pin
- 8-bit family code specifies DS1982 communications requirements to reader
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C; programs at 11.5V to 12.0V from -40°C to +50°C

### F3 MICROCAN™

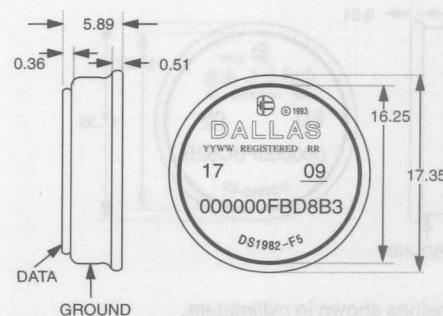


All dimensions shown in millimeters.

### COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire™ protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

### F5 MICROCAN™





# DS1985 16K bit Add-Only iButton™

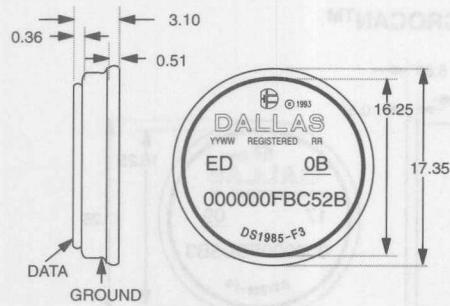
## SPECIAL FEATURES

- 16384-bits Electrically Programmable Read Only Memory (EPROM) communicates with the economy of one signal plus ground
- EPROM partitioned into sixty-four 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Architecture allows software to patch data by superseding an old page in favor of a newly programmed page
- Reduces control, address, data, power, and programming signals to a single data pin
- 8-bit family code specifies DS1985 communications requirements to reader
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C; programs at 11.5V to 12.0V from -40°C to +85°C

## COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number)

## F3 MICROCAN™

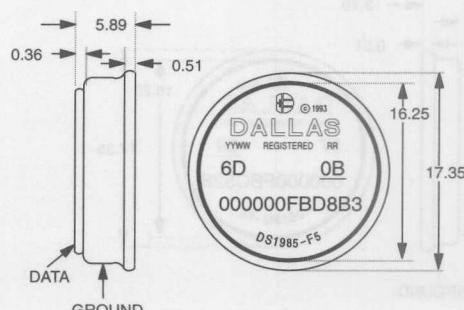


All dimensions shown in millimeters.

+ 8-bit CRC tester) assures absolute traceability because no two parts are alike

- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire™ protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

## F5 MICROCAN™





## DS1986 64K bit Add-Only iButton™

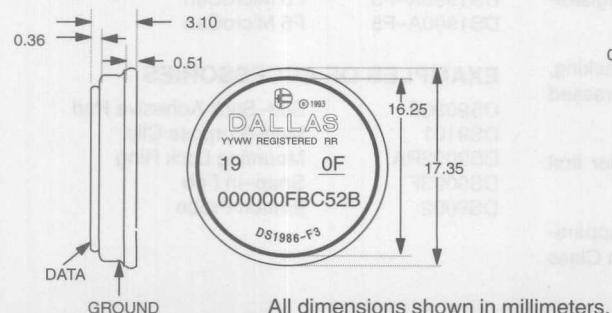
### SPECIAL FEATURES

- 65536-bits Electrically Programmable Read Only Memory (EPROM) communicates with the economy of one signal plus ground
- Overdrive mode boosts communication speed to 142k bits per second
- EPROM partitioned into two hundred and fifty-six 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Architecture allows software to patch data by superseding an old page in favor of a newly programmed page
- Reduces control, address, data, power, and programming signals to a single data pin
- 8-bit family code specifies DS1986 communications requirements to reader
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C; programs at 11.5V to 12.0V from -40°C to +85°C

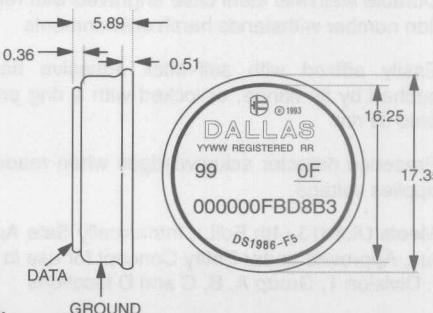
### COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire™ protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

### F3 MICROCAN™



### F5 MICROCAN™





## DS1990A Serial Number iButton™

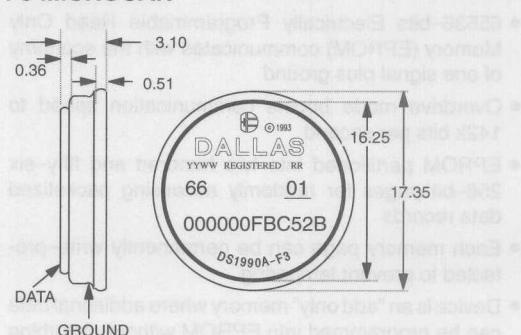
### DS1990A SPECIAL FEATURES

- Upgrade of DS1990 allows multiple Serial Number iButtons to reside on a common bus
- Unique 48-bit serial number
- Low-cost electronic key for access control
- 8-bit CRC for checking data integrity
- Can be read in less than 5 ms
- Operating temperature range of -40°C to +85°C

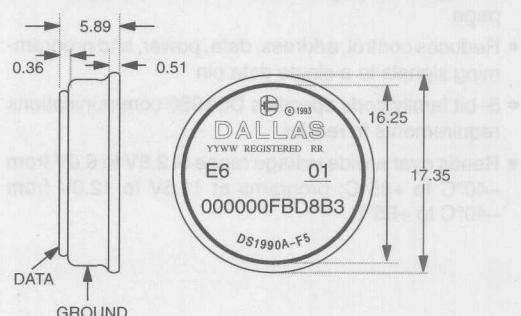
### COMMON iBUTTON FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to an object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire™ protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D locations

### F3 MICROCAN™



### F5 MICROCAN™



All dimensions shown in millimeters

### ORDERING INFORMATION

DS1990A-F3	F3 MicroCan
DS1990A-F5	F5 MicroCan

### EXAMPLES OF ACCESSORIES

DS9096P	Self-Stick Adhesive Pad
DS9101	Multi-Purpose Clip
DS9093RA	Mounting Lock Ring
DS9093F	Snap-In Fob
DS9092	iButton Probe



**DS1991**  
MultiKey iButton™

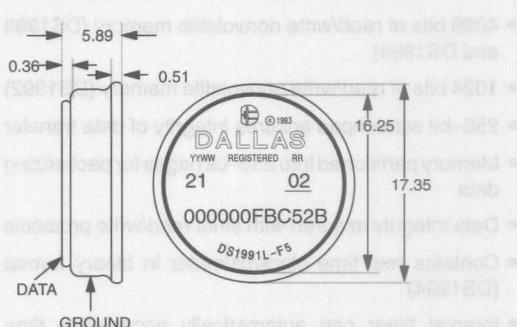
### SPECIAL FEATURES

- 1,152-bit secure read/write, nonvolatile memory
- Secure memory cannot be deciphered without matching 64-bit password
- Memory is partitioned into 3 blocks of 384 bits each
- 64-bit password and ID fields for each memory block
- 512-bit scratchpad ensures data transfer integrity
- Operating temperature range: -40°C to +70°C
- Over 10 years of data retention

### COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations

### F5 MICROCAN™



All dimensions shown in millimeters

### ORDERING INFORMATION

DS1991L-F5      F5 MicroCan

### EXAMPLES OF ACCESSORIES

DS9096P	Self-Stick Adhesive Pad
DS9101	Multi-Purpose Clip
DS9093RA	Mounting Lock Ring
DS9093F	Snap-In Fob
DS9092	iButton Probe



## DS1992/DS1993 1Kbit/4Kbit Memory iButton™ DS1994 4Kbit Plus Time Memory iButton

### SPECIAL FEATURES

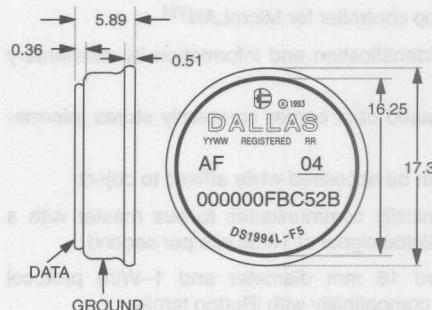
- 4096 bits of read/write nonvolatile memory (DS1993 and DS1994)
- 1024 bits of read/write nonvolatile memory (DS1992)
- 256-bit scratchpad ensures integrity of data transfer
- Memory partitioned into 256-bit pages for packetizing data
- Data integrity assured with strict read/write protocols
- Contains real time clock/calendar in binary format (DS1994)
- Interval timer can automatically accumulate time when power is applied (DS1994)
- Programmable cycle counter can accumulate the number of system power-on/off cycles (DS1994)
- Programmable alarms can be set to generate interrupts for interval timer, real time clock, and/or cycle counter (DS1994)
- Write protect feature provides tamper-proof time data (DS1994)
- Programmable expiration date that will limit access to SRAM and timekeeping (DS1994)
- Clock accuracy is better than  $\pm 2$  minute/month at 25°C (DS1994)
- Operating temperature range from -40°C to +70°C
- Over 10 years of data retention

### COMMON iBUTTON FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second

- Standard 16 mm diameter and 1-Wire protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations

### F5 MICROCAN™



All dimensions shown in millimeters.

### ORDERING INFORMATION

DS1992L-F5	F5 MicroCan
DS1993L-F5	F5 MicroCan
DS1994L-F5	F5 MicroCan

### EXAMPLES OF ACCESSORIES

DS9096P	Self-Stick Adhesive Pad
DS9101	Multi-Purpose Clip
DS9093RA	Mounting Lock Ring
DS9093F	Snap-In Fob
DS9092	iButton Probe



## DS1995 16Kbit Memory iButton™

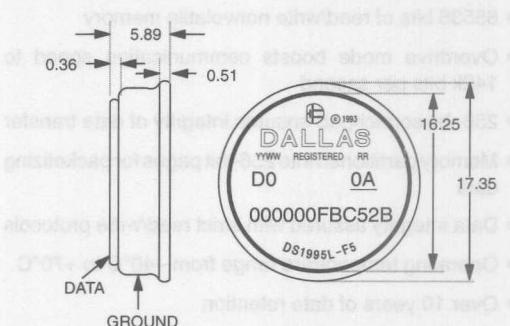
### SPECIAL FEATURES

- 16384 bits of read/write nonvolatile memory
- 256-bit scratchpad ensures integrity of data transfer
- Overdrive mode boosts communication to 142k bits per second
- Memory partitioned into 256-bit pages for packetizing data
- Data integrity assured with strict read/write protocols
- Operating temperature range from -40°C to +70°C
- Over 10 years of data retention

### COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit.); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

### F5 MICROCAN™



All dimensions are shown in millimeters.

### ORDERING INFORMATION

DS1995L-F5 F5 MicroCan

### EXAMPLES OF ACCESSORIES

DS9096P	Self-Stick Adhesive Pad
DS9101	Multi-Purpose Clip
DS9093RA	Mounting Lock Ring
DS9093F	Snap-In Fob
DS9092	iButton Probe

### iButton DESCRIPTION

The DS1995 Memory iButton operates nearly identically to the DS1996. The main differences are: 16K bits of memory organized as 64 pages of 32 bytes and a family code of 0A hexadecimal. For further details please refer to the DS1996 data sheet.



## DS1996 64Kbit Memory iButton™

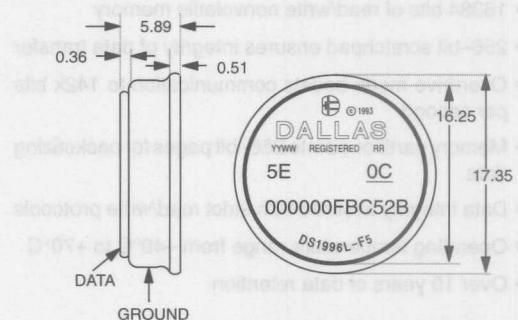
### SPECIAL FEATURES

- 65536 bits of read/write nonvolatile memory
- Overdrive mode boosts communication speed to 142k bits per second
- 256-bit scratchpad ensures integrity of data transfer
- Memory partitioned into 256-bit pages for packetizing data
- Data integrity assured with strict read/write protocols
- Operating temperature range from -40°C to +70°C
- Over 10 years of data retention

### COMMON iButton FEATURES

- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Multidrop controller for MicroLAN™
- Digital identification and information by momentary contact
- Chip-based data carrier compactly stores information
- Data can be accessed while affixed to object
- Economically communicates to bus master with a single digital signal at 16.3k bits per second
- Standard 16 mm diameter and 1-Wire™ protocol ensure compatibility with iButton family
- Button shape is self-aligning with cup-shaped probes
- Durable stainless steel case engraved with registration number withstands harsh environments
- Easily affixed with self-stick adhesive backing, latched by its flange, or locked with a ring pressed onto its rim
- Presence detector acknowledges when reader first applies voltage
- Meets UL#913 (4th Edit); Intrinsically Safe Apparatus, Approved under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations (application pending)

### F5 MICROCAN™



All dimensions are shown in millimeters.

### ORDERING INFORMATION

DS1996L-F5      F5 MicroCan

### EXAMPLES OF ACCESSORIES

DS9096P	Self-Stick Adhesive Pad
DS9101	Multi-Purpose Clip
DS9093RA	Mounting Lock Ring
DS9093F	Snap-In Fob
DS9092	iButton Probe

### iButton DESCRIPTION

The DS1996 Memory iButton is a rugged read/write data carrier that acts as a localized database that can be easily accessed with minimal hardware. The nonvolatile memory offers a simple solution to storing and retrieving vital information pertaining to the object to which the iButton is attached. Data is transferred serially via the 1-Wire protocol which requires only a single data lead and a ground return. The scratchpad is an additional page that acts as a buffer when writing to memory. Data is first written to the scratchpad where it can be read back. After the data has been verified, a copy scratchpad command will transfer the data to memory. This process insures data integrity when modifying the memory.

**DALLAS**  
SEMICONDUCTOR

# DS1820

## 1-Wire™ Digital Thermometer

### FEATURES

- Unique 1-Wire™ interface requires only one port pin for communication
- Multidrop capability simplifies distributed temperature sensing applications
- Requires no external components
- Can be powered from data line
- Zero standby power required
- Measures temperatures from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  in  $0.5^{\circ}\text{C}$  increments. Fahrenheit equivalent is  $-67^{\circ}\text{F}$  to  $+257^{\circ}\text{F}$  in  $0.9^{\circ}\text{F}$  increments
- Temperature is read as a 9-bit digital value.
- Converts temperature to digital word in 200 ms (typ.)
- User-definable, nonvolatile temperature alarm settings
- Alarm search command identifies and addresses devices whose temperature is outside of programmed limits (temperature alarm condition)
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermally sensitive system

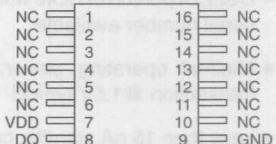
### PIN ASSIGNMENT



DS1820  
PR35 PACKAGE  
See Mech. Drawings  
Section



BOTTOM VIEW



DS1820S  
16-PIN SSOP  
See Mech. Drawings  
Section

### PIN DESCRIPTION

GND	— Ground
DQ	— Data In/Out
V <sub>DD</sub>	— Optional V <sub>DD</sub>
NC	— No Connect

### DESCRIPTION

The DS1820 Digital Thermometer provides 9-bit temperature readings which indicate the temperature of the device.

Information is sent to/from the DS1820 over a 1-Wire interface, so that only one wire (and ground) needs to be connected from a central microprocessor to a DS1820. Power for reading, writing, and performing temperature conversions can be derived from the data line itself with no need for an external power source.

Because each DS1820 contains a unique silicon serial number, multiple DS1820s can exist on the same 1-Wire bus. This allows for placing temperature sensors in many different places. Applications where this feature is useful include HVAC environmental controls, sensing temperatures inside buildings, equipment or machinery, and in process monitoring and control.

# DALLAS

## SEMICONDUCTOR

# DS2223/DS2224

## EconoRAM

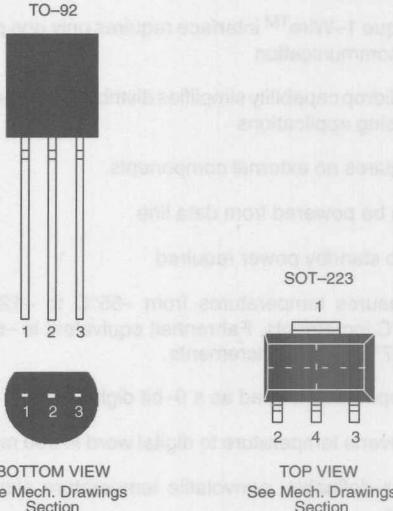
### FEATURES

- Low-cost, general-purpose, 256-bit memory
  - DS2223 has 256-bit SRAM
  - DS2224 has 32-bit ROM, 224-bit SRAM
- Reduces control, address and data interface to a single pin
- Each DS2224 32-bit ROM is factory-lasered with a unique serial number
- DS2224 portion of ROM with custom code and unique serial number available
- Minimal operating power: 45 nanocoulombs per transaction @1.5V typical
- Less than 15 nA standby current at 25°C
- Nonvolatile data retention easily achieved via low-cost alkaline batteries or capacitors
- Directly connects to a port pin of popular microcontrollers
- Operation from 1.2 to 5.5 volts
- Popular TO-92 or SOT-223 surface mount package
- Operates over industrial temperature range -40°C to +85°C

### DESCRIPTION

The DS2223 and DS2224 EconoRAMs are fully static, micro-powered, read/write memories in low-cost TO-92 or SOT-223 packages. The DS2223 is organized as a serial 256 x 1 bit static read/write memory. The DS2224's first 32 bits are lasered with a unique ID code at the time of manufacture; the remaining 224 bits are static read/write memory. Signaling necessary for reading or writing is reduced to just one interface lead.

### PACKAGE OUTLINE



### PIN CONNECTIONS

Pin 1	GND	– Ground
Pin 2	DQ	– Data In/Out
Pin 3	V <sub>CC</sub>	– Supply
Pin 4	GND	– Ground

### ORDERING INFORMATION

DS2223	256-bit SRAM – TO-92 Package
DS2223Z	256-bit SRAM – SOT-223 Package
DS2223T	1000 piece tape-and-reel of DS2223
DS2223Y	2500 piece tape-and-reel of DS2223Z
DS2224	32-bit serial number (ROM), 224-bit SRAM – TO-92 Package
DS2224Z	32-bit serial number (ROM), 224-bit SRAM – SOT-223 Package
DS2224T	1000 piece tape-and-reel of DS2224
DS2224Y	2500 piece tape-and-reel of DS2224Z



# DS2401

## Silicon Serial Number

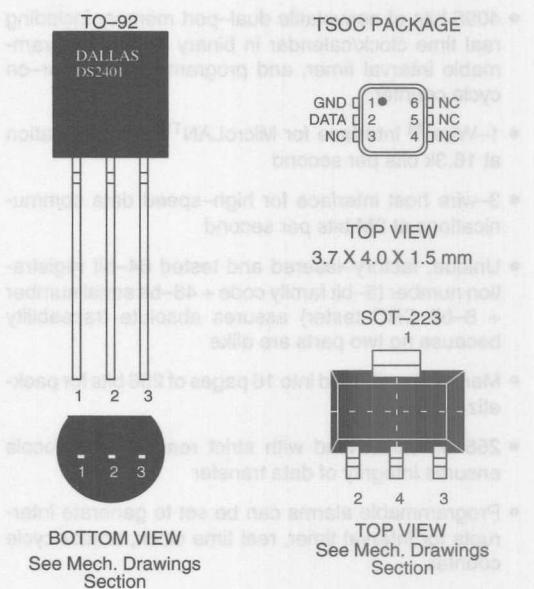
### FEATURES

- Upgrade and drop-in replacement for DS2400
  - Extended 2.8 to 6.0 voltage range
  - Multiple DS2401s can reside on a common 1-Wire™ bus
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester); guaranteed no two parts alike
- Built-in multidrop controller ensures compatibility with other MicroLANTM products
- 8-bit family code specifies DS2401 communications requirements to reader
- Presence pulse acknowledges when the reader first applies voltage
- Low-cost TO-92, SOT-23 and TSOC surface mount packages
- Reduces control, address, and data to a single pin
- Zero standby power required
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits/s
- Pulse width measurement determines 1s or 0s
- Power derived from data line
- Applications
  - PCB Identification
  - Network Node ID
  - Equipment Registration
- Operates over industrial temperature range of -40°C to +85°C

### DESCRIPTION

The DS2401 enhanced Silicon Serial Number is a low-cost, electronic registration number that provides an absolutely unique identity which can be determined with a minimal electronic interface, typically a single port pin of a microcontroller. The DS2401 consists of a factory-

### PIN ASSIGNMENT



### PIN DESCRIPTION

#### TO-92/SOT-23

Pin 1	- Ground
Pin 2	- Data (DQ)
Pin 3	- No Connect
Pin 4	- Ground

#### TSOC

Pin 1	- Ground
Pin 2	- Data (DQ)
Pin 3	- No Connect
Pin 4-6	- No Connect

### ORDERING INFORMATION

DS2401	TO-92 Package
DS2401Z	SOT-23 Surface Mount Package
DS2401T	Tape & Reel of DS2401
DS2401Y	Tape & Reel of DS2401Z
DS2401P	TSOC Surface Mount Package
DS2401V	Tape & Reel of DS2401P

lasered, 64-bit ROM that includes a unique 48-bit serial number, an 8-bit CRC, and an 8-bit Family Code (01h). Data is transferred serially via the 1-Wire protocol which requires only a single data lead and a ground return.

## FEATURES

- 4096 bits of nonvolatile dual-port memory including real time clock/calendar in binary format, programmable interval timer, and programmable power-on cycle counter
- 1-Wire™ interface for MicroLAN™ communication at 16.3k bits per second
- 3-wire host interface for high-speed data communications at 2M bits per second
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Memory partitioned into 16 pages of 256 bits for pack- etizing data
- 256-bit scratchpad with strict read/write protocols ensures integrity of data transfer
- Programmable alarms can be set to generate interrupts for interval timer, real time clock, and/or cycle counter
- 16-pin DIP, SOIC and SSOP packages
- Operating temperature range from -40°C to +85°C
- Operating voltage range from 2.8 to 5.5 Volts

## DESCRIPTION

The DS2404 EconoRAM Time Chip offers a simple solution for storing and retrieving vital data and time information with minimal hardware. The DS2404 contains a unique laser ROM, real-time clock/calendar, interval timer, cycle counter, programmable interrupts and 4096-bits of SRAM. Two separate ports are provided for communication, 1-Wire and 3-wire. Using the 1-Wire port, only one pin is required for communication, and the laser ROM can be read even when the DS2404 is without power. The 3-wire port provides high

## PIN ASSIGNMENT



16-PIN DIP (300 MIL)

16-PIN SOIC (300 MIL)

16-PIN SSOP (300 MIL)

See Mechanical Drawings Section

## PIN DESCRIPTION

V <sub>CC</sub>	- 2.8 to 5.5 Volts
IRQ	- Interrupt Output
RST	- 3-Wire Reset Input
DQ	- 3-Wire Input/Output
I/O	- 1-Wire Input/Output
CLK	- 3-Wire Clock Input
NC	- No Connection
GND	- Ground
V <sub>BATB</sub>	- Battery Backup Input
V <sub>BATO</sub>	- Battery Operate Input
1 Hz	- 1 Hz Output
X <sub>1,X<sub>2</sub></sub>	- Crystal Connections

## ORDERING INFORMATION

DS2404	16-pin DIP
DS2404S	16-pin SOIC
DS2404B	16-pin SSOP

speed communication using the traditional Dallas Semiconductor 3-wire interface. With either interface, a strict protocol for accessing the DS2404 insures data integrity. Utilizing backup energy sources, the data is nonvolatile and allows for stand-alone operation.

The DS2404 features can be used to create a stopwatch, alarm clock, time and date stamp, logbook, hour meter, calendar, system power cycle timer, expiration timer, and event scheduler.



# DS2404S-C01

## Dual Port Memory Plus Time

### FEATURES

- Bridge for electronic equipment to the 1-Wire MicroLAN
- 4096 bits of nonvolatile dual-port memory including real time clock/calendar in binary format, programmable interval timer, and programmable power-on cycle counter
- 1-Wire™ interface for MicroLAN communication at 16.3k bits per second
- 3-Wire host interface for high-speed data communications at 2M bits per second
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Memory partitioned into 16 pages of 256 bits for pack- etizing data
- 256-bit scratchpad with strict read/write protocols ensures integrity of data transfer
- Programmable alarms can be set to generate inter- rupts for interval timer, real time clock, and/or cycle counter
- Space saving 16-pin SOIC package
- Operating temperature range from -40°C to +85°C
- Operating voltage range from 2.8 to 5.5 Volts

### DESCRIPTION

In order to provide universal access to the MicroLAN, the DS2404S-C01 Dual Port Memory Plus Time has been developed. This device has both 1-Wire and a 3-Wire serial microcontroller interface. The DS2404S-C01 can be used to make complex functions involving microcontrollers behave as if they were iButtons.

### PIN ASSIGNMENT

VCC	1	16	VCC
IRQ	2	15	X1
RST	3	14	X2
DQ	4	13	GND
I/O	5	12	NC
CLK	6	11	1HZ
NC	7	10	VBATO
GND	8	9	VBATB

16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

Pin #	Pin Name	Description
Pin 1&16	- V <sub>CC</sub>	2.8 to 5.5 Volts
Pin 2	- IRQ	Interrupt Output
Pin 3	- RST	3-Wire Reset Input
Pin 4	- DQ	3-Wire Input/Output
Pin 5	- I/O	1-wire Input/Output
Pin 6	- CLK	3-Wire Clock Input
Pin 7 & 12	- NC	No Connection
Pin 8 & 13	- GND	Ground
Pin 9	- V <sub>BATB</sub>	Battery Backup Input
Pin 10	- VBATO	Battery Operate Input
Pin 11	- 1 Hz	1 Hz Output
Pin 14 & 15	- X <sub>1</sub> , X <sub>2</sub>	Crystal Connections

Being a custom-ROM version of the DS2404, the DS2404S-C01 has the family code 84H. In addition to this, the 12 most significant bit of the serialization field are coded 001H, leaving 28 bits for serialization. The communication with the DS2404S-C01 through the 1-Wire port is identical to the DS1994; all functions of the DS1994 are available.

**DALLAS**  
SEMICONDUCTOR

## DS2405 Addressable Switch

### FEATURES

- Open drain PIO pin is controlled by matching 64-bit, laser-engraved registration number associated with each device
- Logic level of open drain output can be determined over 1-Wire™ bus for closed-loop control
- PIO pin sink capability is greater than 4 mA at 0.4V
- Multiple DS2405s can be identified on a common 1-Wire bus and be turned on or off independently of other devices on the bus
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute identity because no two parts are alike
- Built-in multidrop controller ensures compatibility with other MicroLANTM products
- Reduces control, address, data, and power to a single data pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3kbits/s
- 8-bit family code specifies DS2405 communications requirements to reader
- 8-bit cyclic redundancy check ensures error-free selection
- Zero standby power required
- Low cost TO-92, SOT-223, or 6-pin C-Lead surface mount package
- 1-Wire communication operates over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C

### ORDERING INFORMATION

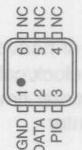
DS2405	TO-92 package
DS2405Z	4-pin SOT-223 package
DS2405P	6-pin C-lead package
DS2405T	Tape & Reel version of DS2405
DS2405Y	Tape & Reel version of DS2405Z
DS2405V	Tape & Reel version of DS2405P

### PIN ASSIGNMENT

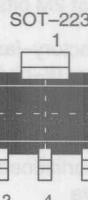


BOTTOM VIEW

### C-LEAD PACKAGE



TOP VIEW  
3.7 X 4.0 X 1.5 mm

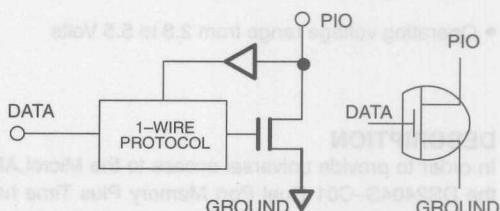


TOP VIEW

### PIN DESCRIPTION

Pin 1	- Ground
Pin 2	- Data
Pin 3	- PIO
Pin 4	- Ground

Pin 1	- Ground
Pin 2	- Data
Pin 3	- PIO
Pin 4-6	- No Connect



**DALLAS**  
SEMICONDUCTOR

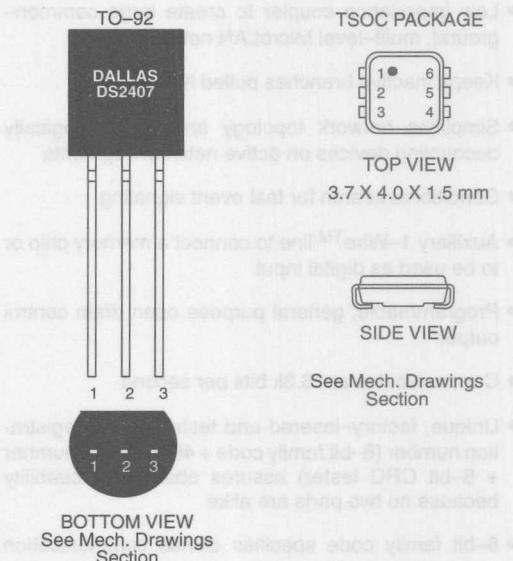
## DS2407

### Dual Addressable Switch Plus 1K-Bit Memory

#### FEATURES

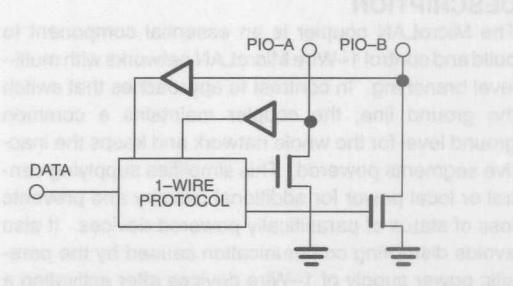
- Open drain PIO pins are controlled and their logic level can be determined over 1-Wire™ bus for closed-loop control
- Dual Channel operation (TSOC package)
- PIO pin channel A sink capability of 50 mA at 0.4V with soft turn-on; channel B 8 mA at 0.4V
- Maximum operating voltage of 13V at PIO-A, 6.5V at PIO-B
- 1024 bits user-programmable OTP EPROM
- 7 bytes of user-programmable status memory to control the device
- Multiple DS2407s can be identified on a common 1-Wire bus and be turned on or off independently of other devices on the bus
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures error-free selection and absolute identity because no two parts are alike
- On-chip CRC16 generator allows detection of data transfer errors
- Built-in multidrop controller ensures compatibility with other MicroLAN™ products
- Reduces control, address, data, programming and power to a single data pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits/s
- Low cost TO-92 or 6-pin TSOC surface mount package
- 1-Wire communication operates over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C
- Supports Conditional Search with user-programmable condition
- V<sub>CC</sub> bondout for optional external supply to the device (TSOC package only)
- Hidden Mode; the device will respond only to a Match ROM command or a Conditional Search when in this mode.

#### PIN ASSIGNMENT



#### PIN DESCRIPTION

	TO-92	TSOC
Pin 1	Ground	Ground
Pin 2	Data	Data
Pin 3	PIO-A	PIO-A
Pin 4	—	V <sub>CC</sub>
Pin 5	—	NC
Pin 6	—	PIO-B



## FEATURES

- Low impedance coupler to create large common-ground, multi-level MicroLAN networks
- Keeps inactive branches pulled high to 5V
- Simplifies network topology analysis by logically decoupling devices on active network segments
- Conditional search for fast event signaling
- Auxiliary 1-Wire™ line to connect a memory chip or to be used as digital input
- Programmable, general purpose open drain control output
- Communicates at 16.3k bits per second
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- 8-bit family code specifies device communication requirements to bus master
- Built-in multidrop controller ensures compatibility with other MicroLAN products
- Operating temperature range from -40°C to +85°C
- Compact, low cost 6-pin TSOC surface mount package

## DESCRIPTION

The MicroLAN coupler is an essential component to build and control 1-Wire MicroLAN networks with multi-level branching. In contrast to approaches that switch the ground line, the coupler maintains a common ground level for the whole network and keeps the inactive segments powered. This simplifies supplying central or local power for additional circuitry and prevents loss of status of parasitically powered devices. It also avoids disrupting communication caused by the parasitic power supply of 1-Wire devices after activating a

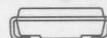
## PIN ASSIGNMENT

### 6-PIN TSOC PACKAGE



TOP VIEW

3.7 X 4.0 X 1.5 mm



SIDE VIEW

## PIN DESCRIPTION

- |       |                      |
|-------|----------------------|
| Pin 1 | GND                  |
| Pin 2 | 1-Wire in            |
| Pin 3 | Main 1-Wire out      |
| Pin 4 | Auxiliary 1-Wire out |
| Pin 5 | Control Output       |
| Pin 6 | VDD                  |

## ORDERING INFORMATION

DS2409P 6-pin TSOC package

branch. The coupler does not contain any user-programmable memory. To label a branch one can connect any 1-Wire memory device to the auxiliary 1-Wire output of the coupler. Both the main and the auxiliary 1-Wire output are supported by a "smart-on" command. This command generates a reset/presence sequence on the selected output **before** the electronic switch closes the contact to the 1-Wire bus.



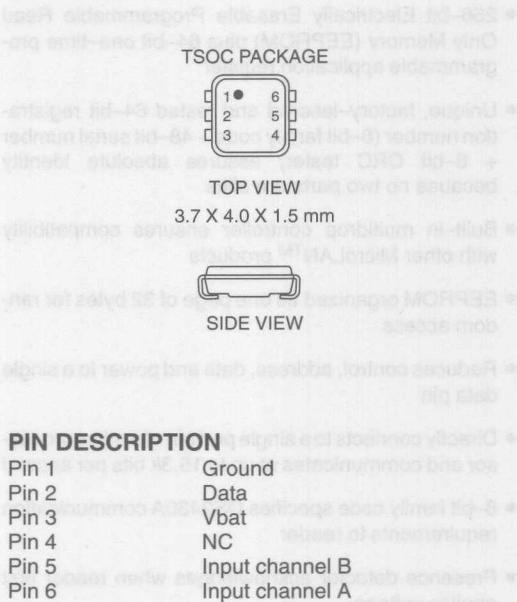
# DS2422/DS2423

## 1K/4K-Bit 1-Wire™ RAM with Counters

### FEATURES

- 4096 bits of SRAM (DS2423), 1024 bits with the DS2422
- Four 32-bit read-only counters (DS2423), three counters with the DS2422
- Active-low external trigger inputs for two of the counters with on-chip debouncing compatible with reed and Wiegand switches
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Memory partitioned into 16 256-bit pages in DS2423, (4 pages in DS2422), for packetizing data
- 256-bit scratchpad with strict read/write protocols ensures integrity of data transfer
- On-chip 16-bit CRC generator for safeguarding data transfers
- Built-in multidrop controller ensures compatibility with other MicroLAN™ products
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- Overdrive mode boosts communication speed to 142k bits per second
- 8-bit family code specifies device communication requirements to reader
- Presence detector acknowledges when reader first applies voltage
- Compact, low cost 6-pin TSOC surface mount package
- Reads, writes and counts over a wide voltage range of 2.8V to 5.5V from -40°C to +85°C

### PIN ASSIGNMENT



### PIN DESCRIPTION

Pin 1	Ground
Pin 2	Data
Pin 3	Vbat
Pin 4	NC
Pin 5	Input channel B
Pin 6	Input channel A

### ORDERING INFORMATION

contact factory

### DESCRIPTION

The DS2422/DS2423 1-Wire™ RAM With Counters (hereafter referred to as DS242X) is a fully static, read/write memory for battery operation in a low cost 6-lead TSOC surface mount package. The memory is organized as sixteen pages (DS2423) or four pages (DS2422) of 256 bits each. In addition, the device has four (DS2423) or three (DS2422) counters, two of them with external trigger inputs called A and B. Each of the counters is associated with a memory page. A counter without external trigger input increments each time data is written to the page it is associated with (Write Cycle Counter). The counters triggered by inputs A and B, respectively, increment with every low-going pulse on their input. All counters are read-only. They are automatically cleared to zero when the battery is connected.

**DALLAS**  
SEMICONDUCTOR

**DS2430A**  
256-Bit 1-Wire™ EEPROM

## FEATURES

- 256-bit Electrically Erasable Programmable Read Only Memory (EEPROM) plus 64-bit one-time programmable application register
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute identity because no two parts are alike
- Built-in multidrop controller ensures compatibility with other MicroLAN™ products
- EEPROM organized as one page of 32 bytes for random access
- Reduces control, address, data and power to a single data pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- 8-bit family code specifies DS2430A communication requirements to reader
- Presence detector acknowledges when reader first applies voltage
- Low cost TO-92 or 6-pin TSOC surface mount package
- Reads and writes over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C

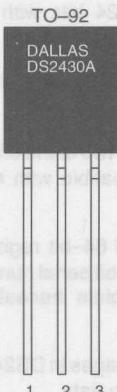
## ORDERING INFORMATION

DS2430A	TO-92 package
DS2430AP	6-pin TSOC package
DS2430AT	Tape & Reel version of DS2430A
DS2430AV	Tape & Reel version of DS2430AP

## SILICON LABEL DESCRIPTION

The DS2430A 256-bit 1-Wire EEPROM identifies and stores relevant information about the product to which it is associated. This lot or product specific information can be accessed with minimal interface, for example a single port pin of a microcontroller. The DS2430A consists of a factory-lasered registration number that

## PIN ASSIGNMENT



TSOC PACKAGE  
TOP VIEW  
3.7 X 4.0 X 1.5 mm  
See Mech. Drawings Section



SIDE VIEW  
See Mech. Drawings Section



BOTTOM VIEW  
See Mech. Drawings Section

## PIN DESCRIPTION

TO-92	TSOC
Pin 1	Ground
Pin 2	Data
Pin 3	NC
Pin 4	NC
Pin 5	NC
Pin 6	NC

includes a unique 48-bit serial number, an 8-bit CRC, and an 8-bit Family Code (14h) plus 256 bits of user-programmable EEPROM and a 64-bit one-time programmable application register. The power to read and write the DS2430A is derived entirely from the 1-Wire communication line.

**DALLAS**  
SEMICONDUCTOR

**DS2433**  
4K-Bit 1-Wire™ EEPROM

## FEATURES

- 4096 bits Electrically Erasable Programmable Read Only Memory (EEPROM)
- Unique, factorylasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute identity because no two parts are alike
- Built-in multidrop controller ensures compatibility with other MicroLAN products
- Memory partitioned into sixteen 256-bit pages for packetizing data
- 256-bit scratchpad with strict read/write protocols ensures integrity of data transfer
- Reduces control, address, data and power to a single data pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- Overdrive mode boosts communication speed to 142k bits per second
- 8-bit family code specifies DS2433 communication requirements to reader
- Presence detector acknowledges when reader first applies voltage
- Low cost PR-35 or 8-pin SOIC surface mount package
- Reads and writes over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C

## SILICON LABEL DESCRIPTION

The DS2433 4K-bit 1-Wire EEPROM identifies and stores relevant information about the product to which it is associated. This lot or product specific information can be accessed with minimal interface, for example a single port pin of a microcontroller. The DS2433 consists of a factory-lasered registration number that

## PIN ASSIGNMENT



NC	1	8	NC
NC	2	7	NC
DATA	3	6	NC
GND	4	5	NC

8-PIN SOIC (208 MIL)



PR-35

BOTTOM VIEW

## PIN DESCRIPTION

### PR-35

Pin 1	Ground	NC
Pin 2	Data	NC
Pin 3	NC	Data
Pin 4	—	Ground
Pin 5-8	—	NC

## ORDERING INFORMATION

DS2433	PR-35 package
DS2433S	8-pin SOIC package
DS2433T	Tape & Reel version of DS2433
DS2433Y	Tape & Reel version of DS2433S

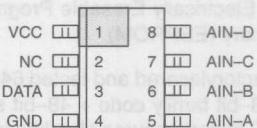
includes a unique 48-bit serial number, an 8-bit CRC, and an 8-bit Family Code (23h) plus 4096 bits of user-programmable EEPROM. The power to read and write the DS2433 is derived entirely from the 1-Wire communication line. The memory is organized as sixteen pages of 256 bits each.

**FEATURES**

- Four high-impedance inputs to measure analog voltages over the 1-Wire bus
- User programmable input range (2.56V, 5.12V), resolution (1 to 16 bits) and alarm thresholds
- 5V, single supply operation
- Very low power: 2.5mW active, 25  $\mu$ W idle
- Built-in multidrop controller allows multiple DS2450's to be identified and operated on a common 1-Wire bus
- Responds to Conditional Search if the analog voltage crosses the alarm thresholds
- Channels not used as analog input can serve as open drain digital outputs for closed-loop control
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- Overdrive mode boosts communication speed to 142k bits per second
- On-chip 16-bit CRC-generator for safeguarding data transfers
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- 8-bit family code specifies device communication requirements to bus master
- Operating temperature range from -40°C to +85°C
- Compact, low cost 8-pin SOIC surface mount package

**DESCRIPTION**

The DS2450 1-Wire Quad A/D Converter is based on a successive-approximation analog to digital converter with a four to one analog multiplexer. Each input channel has its own register set to store the input voltage range, resolution, and alarm threshold values as well as flags to enable participation of the device in the conditional search if the input voltage leaves the specified range. Two alarm flags for each channel indicate if the voltage measured was too high or too low without requiring the bus master to do the comparison. Each A/D conversion is initiated by the bus master. A channel not used as analog input can serve as a digital open-drain output. After disabling the input the bus master

**PIN ASSIGNMENT**

8-PIN SOIC (208 MIL)

**PIN DESCRIPTION**

V <sub>CC</sub>	4.5 to 5.5 Volts
NC	NOT CONNECTED
DATA	1-Wire Bus
GND	Ground
AIN-A	Analog Input A
AIN-B	Analog Input B
AIN-C	Analog Input C
AIN-D	Analog Input D

**ORDERING INFORMATION**

DS2450S 8-pin SOIC

can directly switch on or off the open-drain transistor at the selected channel. All device settings are stored in SRAM and kept non-volatile while the device gets power either through the 1-Wire bus or through its V<sub>CC</sub> pin. After powering up a power-on reset flag signals the bus master the need to restore the device settings before the regular operation can resume. All device registers and conversion read-out registers are organized as three 8-byte memory pages similar to the Status Memory of a DS2505/6 device. An on-chip CRC16 generator protects the communication against transmission errors when reading through the end of a memory page as well as when writing individual bytes.

**DALLAS**  
SEMICONDUCTOR

**DS2480**  
Serial 1-Wire™ Line Driver

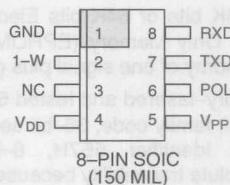
## FEATURES

- Universal, common-ground serial port to 1-Wire™ line driver for MicroLAN™ applications
- Works with all iButtons and MicroLAN-compatible 1-Wire slave devices
- Communicates at regular and Overdrive 1-Wire speed and serial port data rates of 9600 (default), 19200, 57600 and 115200 bps
- Supports 12V EPROM programming and stiff 5V pull-up for Crypto iButton, sensors and EEPROM
- Self-calibrating time base with  $\pm 5\%$  tolerance for serial and 1-Wire communication
- Slew rate controlled 1-Wire pull-down and active pull-up to accommodate long lines and reduce radiation
- User-selectable RXD/TXD polarity minimizes component count when interfacing to 5V based RS232 systems or directly to UARTs
- Programmable 1-Wire timing and driver characteristics accommodate a wide range of MicroLAN configurations at regular speed
- Smart protocol combines data and control information without requiring extra pins
- Compatible to optical, IR and RF to RS232 converters
- Low cost 8-pin SOIC surface mount package
- Operates over 4.5V to 5.5V from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## DESCRIPTION

The DS2480 is a serial port to 1-Wire interface chip that supports standard and Overdrive speeds. It connects directly to UARTs and 5V RS232 systems. Interfacing to RS232C ( $\pm 12\text{V}$  levels) requires a passive clamping circuit and one 5V to  $\pm 12\text{V}$  level translator. Internal timers relieve the host of the burden of generating the time-critical 1-Wire communication waveforms. In contrast to the DS9097(E) where a full character must be sent by the host for each 1-Wire time slot, the DS2480 can translate each character into eight 1-Wire time slots thereby increasing the data throughput significantly. In addition, the DS2480 can be set to communicate at four different data rates including 115.2 kbps, 57.6 kbps and 19.2 kbps with 9.6 kbps being the power-on default.

## PIN ASSIGNMENT



## PIN DESCRIPTION

GND	Ground
1-W	1-Wire Input/Output
NC	No Connection
V <sub>DD</sub>	4.5 to 5.5 Volts
V <sub>PP</sub>	Optional EPROM
POL	Programming Voltage
TXD	RXD/TXD Polarity Select
RXD	Serial Data from UART
	Serial Data to UART

## ORDERING INFORMATION

DS2480S 8-pin SOIC

Command codes received from the host's crystal controlled UART serve as a reference to continuously calibrate the on-chip timing generator. The DS2480 uses a unique protocol that merges data and control information without requiring control pins. This approach maintains compatibility to off-the-shelf serial to wireless converters allowing easy realization of 1-Wire media jumpers. The various control functions of the DS2480 are optimized for MicroLAN 1-Wire networks and support the special needs of all current 1-Wire devices including the Crypto iButton, EEPROM-based Add-Only Memories, EEPROM devices and 1-Wire Thermometers.

**DALLAS**  
SEMICONDUCTOR

**DS2502/5/6-UNW**  
UniqueWare™ Add-Only Memory

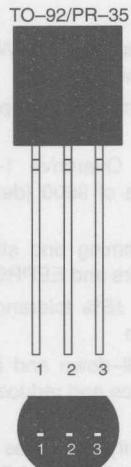
### SPECIAL FEATURES

- 1024 bits, 16K bits or 64K bits Electrically Programmable Read Only Memory (EPROM) communicates with the economy of one signal plus ground
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code, 36-bit serialization, 12-bit UniqueWare Identifier 5E7H, 8-bit CRC-tester) assures absolute traceability because no two parts are alike.
- Built-in multidrop controller ensures compatibility with other MicroLAN products
- EPROM partitioned into two 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Reduces control, address, data, power and programming signals to a single pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- Presence detector acknowledges when reader first applies voltage
- Low cost TO-92/PR-35 or 8-pin SOIC and TSOC surface mount packages
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C

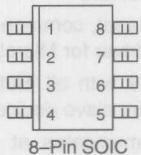
### SILICON LABEL DESCRIPTION

UniqueWare Add-Only Memories are factory programmed versions of the DS2502 (1024 bit), the DS2505 (16K bit) and the DS2506 (64K bit) Add-Only Memories, respectively. They differ from the regular devices in their custom ROM family codes (see Ordering Information) and the UniqueWare Identifier 5E7 in place of the upper 12 bits of the standard serialization field. For technical details on the devices please refer to the DS2502, DS2505 and DS2506 data sheets.

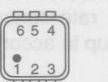
UniqueWare Add-Only Memories are only available preprogrammed with customer-specific and write-protected data. UniqueWare data fills at least one but no



BOTTOM VIEW  
See Mech. Drawings  
Section



See Mech. Drawings  
Section



TOP VIEW  
3.7 X 4.0 X 1.5 mm  
See Mech. Drawings  
Section

### PIN ASSIGNMENT

	TO-92/PR-35	TSOC	SOIC
Pin 1	Ground	Ground	NC
Pin 2	Data	Data	NC
Pin 3	NC	NC	Data
Pin 4	—	NC	Ground
Pins 5 to 8	—	NC	NC

more than the first four pages of a device, depending on the length of the customer-supplied data. This leaves up to three (DS2502-UNW), 63 (DS2505-UNW) or 255 (DS2506-UNW) memory pages available for programming in the application.

For more details on UniqueWare and how to set up data files, please refer to the UniqueWare Project Setup Manual, available as Application Note 99 from Dallas Semiconductor. The UniqueWare Project Setup Software is available from the Dallas Semiconductor FTP Site at [ftp://ftp.dalsemi.com/pub/auto\\_id,unwsetup.exe](http://ftp.dalsemi.com/pub/auto_id,unwsetup.exe).

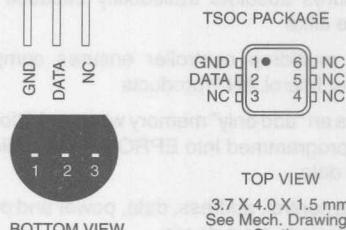
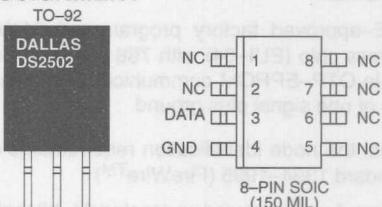
**DALLAS**  
SEMICONDUCTOR

## DS2502 1 kbit Add-Only Memory

### FEATURES

- 1024 bits Electrically Programmable Read Only Memory (EPROM) communicates with the economy of one signal plus ground
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Built-in multidrop controller ensures compatibility with other MicroLAN™ products
- EPROM partitioned into four 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Architecture allows software to patch data by superseding an old page in favor of a newly programmed page
- Reduces control, address, data, power, and programming signals to a single data pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- 8-bit family code specifies DS2502 communications requirements to reader
- Presence detector acknowledges when the reader first applies voltage
- Low cost TO-92 or 8-pin SOIC and TSOC surface mount package
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C; programs at 11.5V to 12.0V from -40°C to +50°C

### PIN ASSIGNMENT



3.7 X 4.0 X 1.5 mm  
See Mech. Drawings  
Section

### ORDERING INFORMATION

DS2502	TO-92 package
DS2502S	8-pin SOIC package
DS2502P	6-pin TSOC package
DS2502T	Tape & Reel version of DS2502
DS2502Y	Tape & Reel version of DS2502S
DS2502V	Tape & Reel version of DS2502P

### SILICON LABEL DESCRIPTION

The DS2502 1 kbit Add-Only Memory identifies and stores relevant information about the product to which it is associated. This lot or product-specific information can be accessed with minimal interface—for example, a single port pin of a microcontroller. The DS2502 consists of a factory-lasered registration number that includes a unique 48-bit serial number, an 8-bit CRC, and an 8-bit Family Code (09h) plus 1K-bit of EPROM which is user-programmable. The power to program and read the DS2502 is derived entirely from the 1-Wire™ communication line.

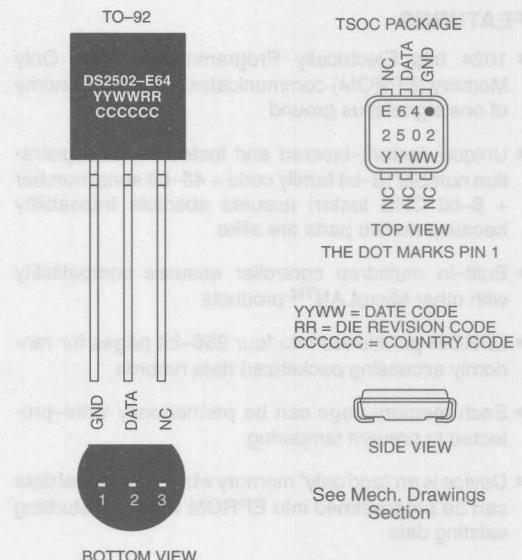
**FEATURES**

- IEEE-approved factory programmed 64-bit node address chip (EUI-64) with 768 bits user-programmable OTP-EPROM communicates with the economy of one signal plus ground
- Meets the node identification requirements of IEEE Standard 1394-1995 (FireWire™)
- Unique, factory lasered and tested 64-bit registration number (8-bit family code 89H + 36-bit serial number + 12-bit UniqueWare Identifier 5E7H + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Built-in multidrop controller ensures compatibility with other MicroLAN™ products
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Reduces control, address, data, power and programming signals to a single pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- Presence detector acknowledges when reader first applies voltage
- Low cost TO-92 or TSOC surface mount packages
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C; programs at 11.5V to 12.0V from -40°C to +50°C

**GLOBAL IDENTIFIER DESCRIPTION**

The DS2502-E64 is a variant of the DS2502 1024-bit Add-Only Memory. It differs from the standard DS2502 in its custom ROM family code 89H, and the UniqueWare Identifier 5E7 in place of the upper 12 bits of the standard ROM serialization field. Otherwise, the electrical and logical behavior is identical to that of the DS2502. For technical details please refer to the DS2502 data sheet.

The first 32 bytes of the DS2502-E64's EPROM memory contain a globally unique 64-bit node address (EUI-64) and are write-protected. The data structure

See Mech. Drawings  
Section**ORDERING INFORMATION**

DS2502-E64      TO-92 package  
DS2502P-E64      6-pin TSOC package

follows the conventions of UniqueWare devices using Default Data Structure (Figure 1).

The data record starts with a length byte (0CH) and the 4-byte UniqueWare Project ID 00001128H. The next eight bytes contain the EUI-64 global identifier (node address) which consists of an incrementing 40-bit extension identifier and the IEEE-assigned 24-bit company ID value 006035H. A 16-bit CRC ends the data record. The remaining bytes of the 32-byte memory page remain unprogrammed.

## DS2505 16K bit Add-Only Memory

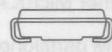
### FEATURES

- 16384 bits Electrically Programmable Read Only Memory (EPROM) communicates with the economy of one signal plus ground
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Built-in multidrop controller ensures compatibility with other MicroLANTM products
- EPROM partitioned into sixty-four 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Architecture allows software to patch data by superseding an old page in favor of a newly programmed page
- Reduces control, address, data, power, and programming signals to a single data pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- 8-bit family code specifies DS2505 communications requirements to reader
- Presence detector acknowledges when the reader first applies voltage
- Low cost TO-92 or 6-pin TSOC surface mount package
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C; programs at 11.5V to 12.0V from -40°C to +85°C

### PIN ASSIGNMENT



TOP VIEW  
3.7 X 4.0 X 1.5 mm



SIDE VIEW  
See Mech. Drawings Section



BOTTOM VIEW  
See Mech. Drawings Section

### ORDERING INFORMATION

DS2505	TO-92 Package
DS2505P	6-pin TSOC Package
DS2505T	Tape & Reel version of DS2505
DS2505V	Tape & Reel version of DS2505P

### SILICON LABEL DESCRIPTION

The DS2505 16k bits Add-Only Memory identifies and stores relevant information about the product to which it is associated. This lot or product specific information can be accessed with minimal interface, for example a single port pin of a microcontroller.



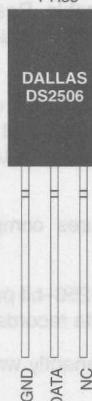
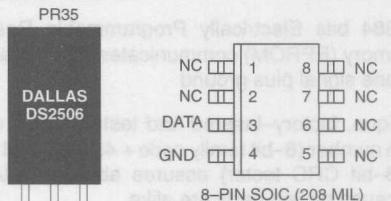
# DS2506

## 64 kbit Add-Only Memory

### FEATURES

- 65536 bits Electrically Programmable Read Only Memory (EPROM) communicate with the economy of one signal plus ground
- Unique, factory-lasered and tested 64-bit registration number (8-bit family code + 48-bit serial number + 8-bit CRC tester) assures absolute traceability because no two parts are alike
- Built-in multidrop controller ensures compatibility with other MicroLANTM products
- EPROM partitioned into two hundred fifty six 256-bit pages for randomly accessing packetized data records
- Each memory page can be permanently write-protected to prevent tampering
- Device is an "add only" memory where additional data can be programmed into EPROM without disturbing existing data
- Architecture allows software to patch data by superseding an old page in favor of a newly programmed page
- Reduces control, address, data, power, and programming signals to a single data pin
- Directly connects to a single port pin of a microprocessor and communicates at up to 16.3k bits per second
- Overdrive mode boosts communication speed to 142k bits per second
- 8-bit family code specifies DS2506 communications requirements to reader
- Presence detector acknowledges when the reader first applies voltage
- Low cost PR35 or 8-pin SOIC surface mount package
- Reads over a wide voltage range of 2.8V to 6.0V from -40°C to +85°C; programs at 11.5V to 12.0V from -40°C to +85°C

### PIN ASSIGNMENT



BOTTOM VIEW  
See Mech. Drawings  
Section

### ORDERING INFORMATION

DS2506 PR35 Package  
DS2506S 8-Pin SOIC Package

### SILICON LABEL DESCRIPTION

The DS2506 64 kbits Add-Only Memory identifies and stores relevant information about the product to which it is associated. This lot or product-specific information can be accessed with minimal interface, for example, a single port pin of a microcontroller. The DS2506 consists of a factory-lasered registration number that includes a unique 48-bit serial number, an 8-bit CRC, and an 8-bit Family Code (0FH) plus 64k-bits of user-programmable EPROM. The power to program and read the DS2506 is derived entirely from the 1-Wire™ communication line. Data is transferred serially via the 1-Wire protocol which requires only a single data lead and a ground return.

**DALLAS**  
SEMICONDUCTOR

## DS9502 ESD Protection Diode

### SPECIAL FEATURES

- Zener characteristic with voltage snap-back to protect against ESD hits
- High avalanche voltage, low leakage and low capacitance avoid signal attenuation
- Compatible to all 5V logic families
- Space saving, low inductance TSOC surface mount package
- Symmetric dual-port bondout to maximize energy dissipation in protection device
- Industrial temperature range

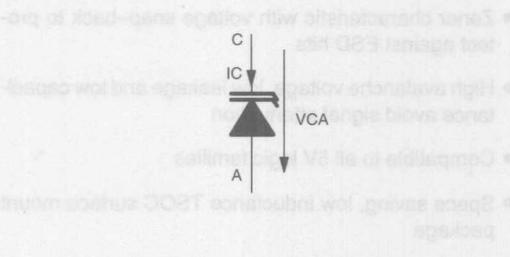


### DESCRIPTION

This DS9502 was designed as an additional ESD protection for SRAM-based battery-buffered portable memory modules. The memory chips used for these modules have already a strong ESD-protection structure on their I/O line. Together with the DS9502 the ESD protection level is raised to more than 27 kV (IEC 801-2 Reference model). In case of abnormal ESD hits beyond its maximum ratings the DS9502 will eventually fail "short," thus preventing further damage.

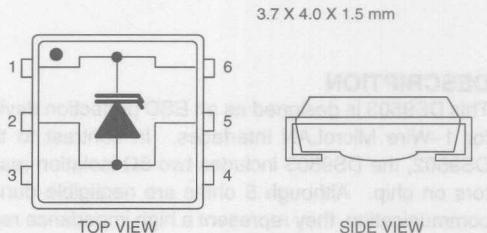
During normal operation the DS9502 behaves like a regular 7.5V Zener diode. When the voltage exceeds the trigger voltage, the I/V characteristic of the device will "snapback," allowing the same or higher amount of current to flow, but at a significantly lower voltage. As long as a minimum current or voltage is maintained, the device will stay in the "snapback mode." If the voltage or the current falls below the holding voltage or holding current, the device will abruptly change to its normal mode and conduct only a small leakage current.

### SYMBOL AND CONVENTIONS



### PACKAGE OUTLINE

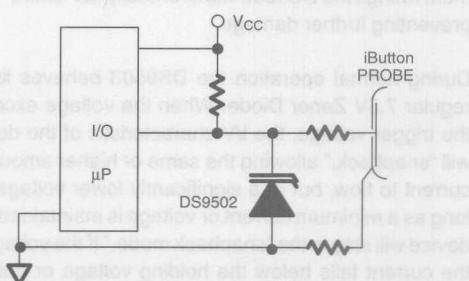
TSOC SURFACE MOUNT PACKAGE



### ORDERING INFORMATION

DS9502P 6-lead TSOC package

### TYPICAL APPLICATION



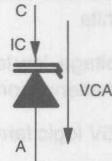
**SPECIAL FEATURES**

- Zener characteristic with voltage snap-back to protect against ESD hits
- High avalanche voltage, low leakage and low capacitance avoid signal attenuation
- Compatible to all 5V logic families
- Space saving, low inductance TSOC surface mount package
- On-chip  $5\Omega$  resistors for isolation at both anode and cathode terminals
- Industrial temperature range

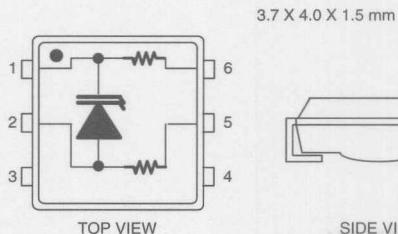
**DESCRIPTION**

This DS9503 is designed as an ESD protection device for 1-Wire MicroLAN interfaces. In contrast to the DS9502, the DS9503 includes two  $5\Omega$  isolation resistors on chip. Although 5 ohms are negligible during communication, they represent a high impedance relative to the conducting diode during an ESD event. Thus, the diode absorbs the energy while the resistors further isolate and protect the circuit at the other side of the package. If used with circuits that already have a strong ESD-protection at their I/O port, the ESD protection level is raised to more than 27 kV (IEC 801-2 Reference model). In case of abnormal ESD hits beyond its maximum ratings the DS9503 will eventually fail "short," thus preventing further damage.

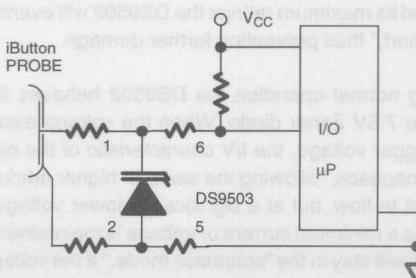
During normal operation the DS9503 behaves like a regular 7.5V Zener Diode. When the voltage exceeds the trigger voltage, the I/V characteristic of the device will "snapback," allowing the same or higher amount of current to flow, but at a significantly lower voltage. As long as a minimum current or voltage is maintained, the device will stay in the "snapback mode." If the voltage or the current falls below the holding voltage or holding current, the device will abruptly change to its normal mode and conduct only a small leakage current.

**SYMBOL AND CONVENTIONS****PACKAGE OUTLINE**

TSOC SURFACE MOUNT PACKAGE

**ORDERING INFORMATION**

DS9503P 6-lead TSOC package

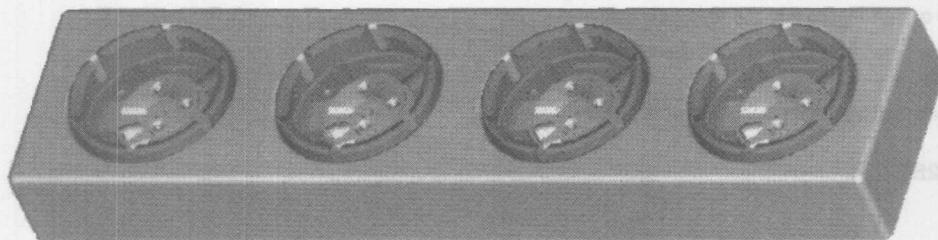
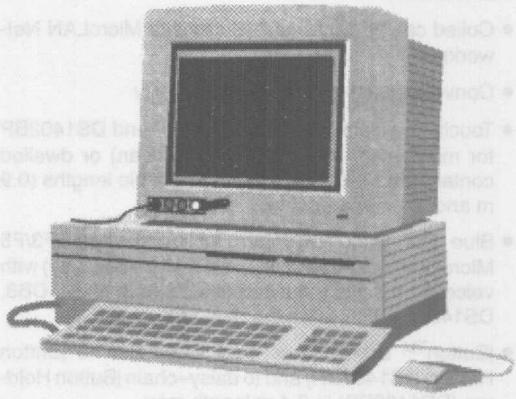
**TYPICAL APPLICATION**



## DS1401 Front Panel iButton™ Holder

### FEATURES

- A convenient interface for iButtons
- Can be used with any Dallas Semiconductor Button holder or port adapter
- Provides from 4 to 24 iButton ports (1 port used for Button Cable connection)
- iButtons can be inserted in any combination
- >10000 insertion/withdrawal cycles with no performance degradation
- Fastens to any convenient location



**DS1401-04**  
approximately actual size

### DESCRIPTION

iButtons can now be conveniently accessed using the DS1401 and DS1402 MicroLAN™ Cables.

The DS1401 is connected to the computer using a DS1402BB8 or DS1402BR8 MicroLAN Cable and any Dallas Button Holder (DS1410, DS1412 or DS1414 series, for example) or DS9097(E) COM Port Adapter. The DS1401 mounts to any surface (top of tower computer, CRT, keyboard).

The DS1401 supports Dallas' MicroLAN architecture, allowing iButtons to be inserted into Button ports in any

combination. Each device's unique 64-bit ID makes location detection automatic.

The DS1401 uses DS9100A and DS9100B Touch and Hold Probe Stampings for ground and data contact, respectively. These stampings are designed for F5 MicroCans and dwelled contact.

The Front Panel Button Holder is available as 4 button version (DS1401-04, picture) and as 24 button panel DS1401-24. Both versions come with double-sided adhesive tape for mounting.

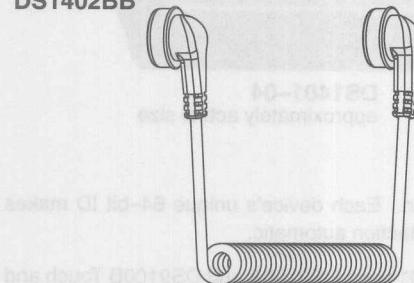
# DALLAS SEMICONDUCTOR

## DS1402x MicroLAN™ Cables

### FEATURES

- Coiled cables to connect iButtons to MicroLAN Networks
- Convenient, off-the-shelf connectivity
- Touch And Hold Probes DS1402RP and DS1402BP for momentary touch (F3/F5 MicroCan) or dwelled contact (F5 MicroCan only) in two cable lengths (0.9 m and 2.4 m max.)
- Blue Dot Dual Receptors for momentary (F3/F5 MicroCan) or dwelled contact (F5 MicroCan only) with velcro backing to mount on objects (DS1402D-DB8, DS1402D-DR8, each 2.4 m max.)
- iButton™ cables to connect COM Port to iButton Holder (DS1402BR) and to daisy-chain iButton Holders (DS1402BB) in 2.4 m length max.
- RJ-11 cables DS1402RR to extend the length of a probe or button cable in 2.4 m length max.
- Can be used with any Dallas Semiconductor port adapter
- iButtons can be connected in any combination

**DS1402BB**

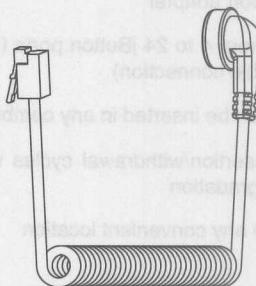


### DESCRIPTION

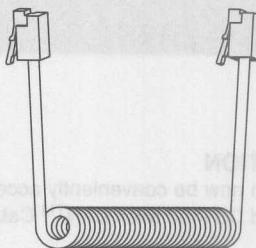
Using four basic types of connectors, RJ-11, iButton, Touch And Hold Probe and Blue Dot Receptor, the DS1402 series of MicroLAN cables provides connectivity for iButtons. The cables are designed to connect COM-port adapter or parallel port adapter to any type of DS1401 front panel iButton Holder or Touch And Hold Probe. The two versions of the Blue Dot Receptor

directly connect to any port adapter. Applications range from software protection to handheld computers and complex MicroLANs.

**DS1402BR**



**DS1402RR**



### ORDERING INFORMATION

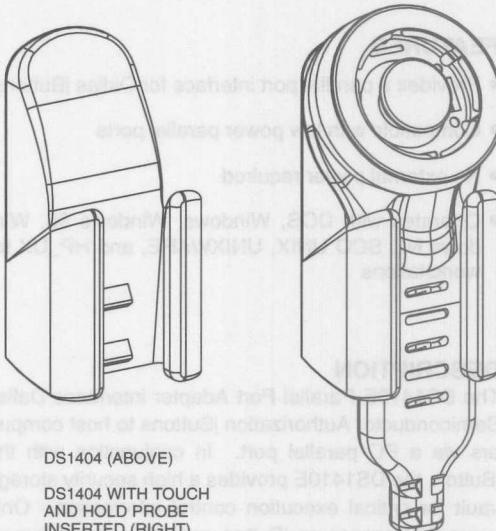
DS1402BB8	2.4 meter (8 feet) cable
DS1402BR8	2.4 meter (8 feet) cable
DS1402RR8	2.4 meter (8 feet) cable
DS1402BP8	2.4 meter (8 feet) cable
DS1402RP3	0.9 meter (3 feet) cable
DS1402RP8	2.4 meter (8 feet) cable
DS1402D-DB8	2.4 meter (8 feet) cable
DS1402D-DR8	2.4 meter (8 feet) cable



## DS1404 Touch and Hold Probe Cable Cradle

### FEATURES

- Precision molded black plastic holder that mounts using double-sided adhesive tape
- Holds the Touch And Hold Probe end of the DS1402RP or DS1402BP
- Probe can be inserted loosely for temporary holding or firmly for probing
- Allows a palmtop or handheld computer to be used as handy iButton™ reader/writer



DS1404 (ABOVE)

DS1404 WITH TOUCH  
AND HOLD PROBE  
INSERTED (RIGHT)

(BOTH PICTURES ARE APPROXIMATELY ACTUAL SIZE)

**DRAWING**  
The DS1404 Drawing illustrates the physical dimensions of the cradle. It shows a front view of the cradle with its two mounting tabs at the bottom. The probe is shown inserted from the bottom, with its circular connector at the top and its probe tip pointing downwards. The drawing highlights the probe's insertion point and the cradle's internal structure.

### DESCRIPTION

With handheld equipment functioning as iButton reader/writer one often faces the problem of finding a place for the probe when it is not used. The DS1404 Touch and Hold Probe Cable Cradle solves this problem. In addition to that, it converts the handheld equipment into a compact single-unit reader/writer for iButtons if the probe is firmly inserted into the cradle.

The DS1404 comes with double-sided adhesive tape. For best results, clean and dry the surface of the object where the DS1404 is to be mounted.

## FEATURES

- Provides a parallel port interface for Dallas iButtons
- Compatible with low power parallel ports
- No external power required
- Operates with DOS, Windows, Windows 95, Windows NT, SCO UNIX, UNIXWARE, and HP\_UX for workstations

## DESCRIPTION

The DS1410E Parallel Port Adapter interfaces Dallas Semiconductor Authorization iButtons to host computers via a PC parallel port. In conjunction with the iButton, the DS1410E provides a high security storage vault for critical execution control information. Only users that possess an iButton can utilize the software, preventing execution of unauthorized copies.

The modularity of the DS1410E allows for easy feature customization. The device supports the insertion of two iButtons, which can be removed and replaced to vary functionality.

For example, a DS1427 Time iButton can be programmed for a 30 day expiration, issued with a DS1410E, and a software copy. The evaluator can be converted into a registered user by issuing a DS1425 Multi iButton and inserting it into the second receptacle.

• Provides a parallel port interface for Dallas iButtons  
• Compatible with low power parallel ports  
• No external power required  
• Operates with DOS, Windows, Windows 95, Windows NT, SCO UNIX, UNIXWARE, and HP\_UX for workstations  
• Provides a high security storage vault for critical execution control information  
• Only users that possess an iButton can utilize the software, preventing execution of unauthorized copies  
• Supports the insertion of two iButtons, which can be removed and replaced to vary functionality

The DS1410E supports the same iButtons as other Dallas port adapters. This allows standardization of any protection scheme across virtually all hardware platforms, regardless of the operating system. The iButtons remain constant, and the port adapters change according to the specific platform interface.

## DS1410E SOFTWARE

The DS1410K Development Kit contains access system software which must be linked with the application software in order to complete integration. The support for the application development environments and operating systems lies in the interface software of the access system. The access system contains the low level interface for communicating with the iButtons.

## DESCRIPTION

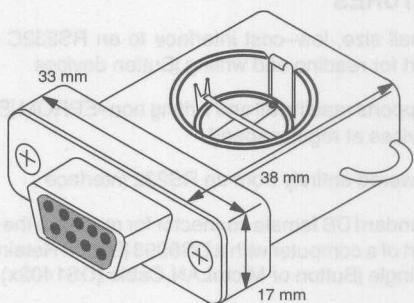
The DS1410E is a parallel port adapter designed to interface with Dallas iButtons. It features a standard parallel port connection and a receptacle for two iButtons. The adapter is designed to be used with Dallas iButton software and drivers.

**DALLAS**  
SEMICONDUCTOR

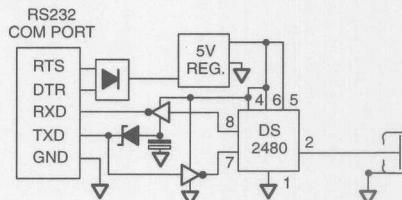
## DS1411 Serial Port iButton™ Holder

### FEATURES

- Small size, true-ground interface to an RS232 COM Port for reading and writing iButton devices
- Works with bipolar logic signals of  $\pm 5V$  to  $\pm 12V$  (RS232C) as well as unipolar signals of 5V to 12V
- Supports reading and writing at regular and Overdrive speeds
- Provides strong pullup to 5V for Temperature iButton, Crypto iButton and EEPROM iButton
- Communicates at data rates of 9.6k (default), 19.2k, 57.6k and 115.2k bits/s
- Powered entirely from an RS232 interface
- Standard DB female connector for mating to the COM Port of a computer with DS9098 iButton Retainer for a single iButton or MicroLAN Cable (DS1402x)



### SCHEMATIC



### ORDERING INFORMATION

DS1411      DB-9 Connector

### DESCRIPTION

The DS1411 is a sophisticated RS232 to 1-Wire™ adapter and iButton holder which performs RS232 level conversion and actively generates the 1-Wire communication signals. Together with an adequate TMEX software driver it enables an IBM-compatible PC or laptop computer to directly read all and write any non-EPROM iButton devices. The DS1411 has a DS9098 retainer for a single F5 MicroCan and can replace the DS9097U-09 in applications that use only a single iButton. Multiple iButtons can be connected using standard MicroLAN Cables and button holders (see DS1401 and DS1402x data sheets). 1-Wire communication is supported by the adapter for regular as well as Overdrive speed. The serial port must support a data transmission rate of 9600

bits/s. Under software control, the adapter can be set up for RS232 data rates of 19200, 57600 and 115200 bits per second. The two higher rates are recommended for communication at Overdrive speed with Overdrive capable devices. Since the DS1411 operates in a byte mode, every data byte received from the RS232 port generates eight time slots on the 1-Wire bus.

The DS1411 is based on the DS2480 Serial 1-Wire Line Driver chip and therefore is **not a plug-in replacement for the DS1412 Serial Port Adapter**. The RXD/ TXD Polarity Select input of the DS2480 is tied to  $V_{DD}$  (non-inverting).

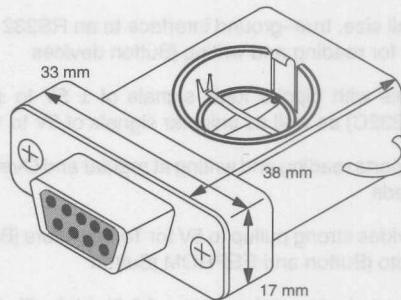


# DS1413

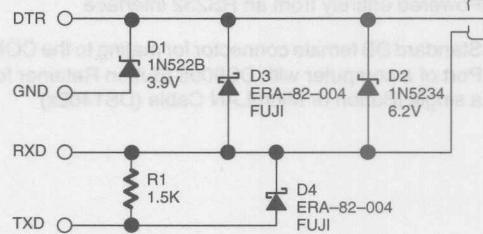
## Passive Serial Port iButton<sup>TM</sup> Holder

### FEATURES

- Small size, low-cost interface to an RS232C COM Port for reading and writing iButton devices
- Supports reading all and writing non-EPROM iButton devices at regular speed
- Powered entirely from an RS232 interface
- Standard DB female connector for mating to the COM Port of a computer with a DS9098 iButton Retainer for a single iButton or MicroLAN Cable (DS1402x)



### SCHEMATIC



### ORDERING INFORMATION

DS1413 DB-9 Connector

### DESCRIPTION

The DS1413 Passive Serial Port iButton Holder is a simple, lowcost adapter which performs RS232C ( $\pm 12V$ ) level conversion, allowing a non-EPROM iButton to be read and written directly. It can also read all EPROM-based iButtons. The serial port must support a data transmission rate of 115.2 kbytes/s in order to create the 1-Wire time slots correctly. Nearly all PCs and several other hardware platforms support the required bit rate and are fully compatible with the DS1413. Since an eight bit character (6 data bits plus start- and stop bit) on the RS232C port operating at 115.2 kbytes/s is used to form a single 1-Wire time slot, the maximum effective 1-Wire transfer rate is 14.4 kbytes/s (regular speed). The

DS1413 has a DS9098 retainer for a single F5 Micro-Can and can replace the DS9097 COM Port Adapter in applications that use only a single iButton. Multiple iButtons can be connected to the DS1413 using standard MicroLAN Cables and button holders (see DS1401 and DS1402x data sheets).

The DS1413 does not support the strong pull-up which is required to run the Crypto iButton. For applications requiring a strong 5V pull-up see DS1411. Details on the operation of the DS1413 are found in Application Note 74, Section V.

**DALLAS**  
SEMICONDUCTOR

**DS9092**  
iButton™ Probe

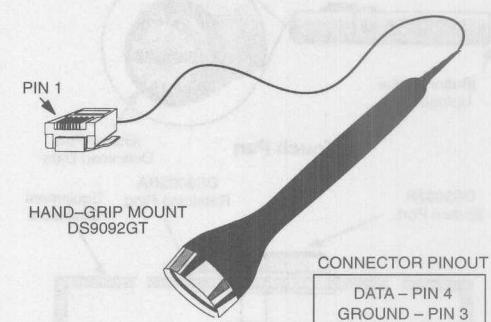
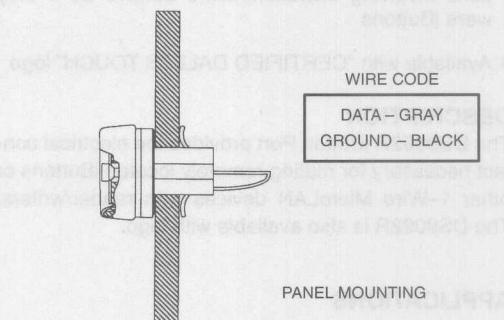
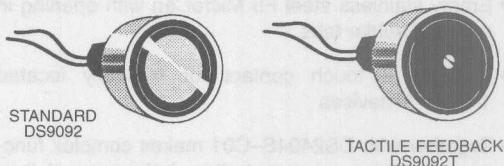
### FEATURES

- Simple, low-cost metal stampings form a read/write probe for the iButton family
- Probe guides the entry of the iButton
- iButton slides over the surface to self-clean contacts
- Accessible shallow probe cavity simplifies removal of debris such as mud
- Flexible design supports panel mount or hand-grip mount with optional tactile feedback
- Bright tarnish-resistant metal surface provides millions of operations
- Panel-mount probe, pre-wired for easy installation
- Hand-grip probe mates to RJ-11 jack for quick installation

### ORDERING INFORMATION

DS9092	Panel-mount probe, solid face
DS9092T	Panel-mount probe with tactile feedback
DS9092GT	Hand-grip mount with tactile feedback

### PACKAGE DESCRIPTION



### DESCRIPTION

The DS9092 iButton Probe provides the electrical contact necessary for the transfer of data to and from the DS19xx family of iButtons. The round probe shape pro-

vides a self-aligning interface that readily matches the circular rim of the iButton's MicroCan package. Metal contacts resist wear and are easy to keep clean.

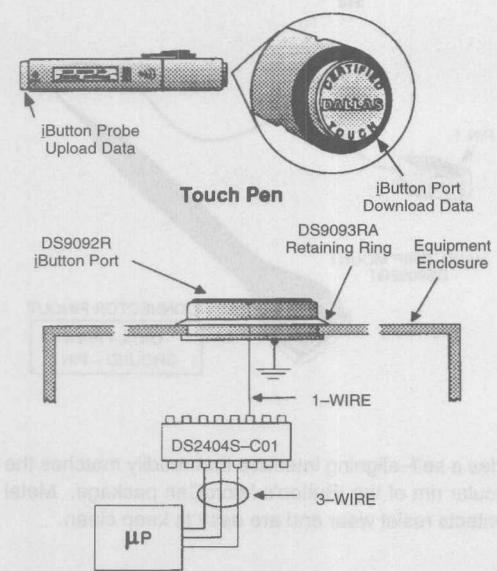
### FEATURES

- Empty stainless steel F5 MicroCan with opening in rear and solder tabs
- Acts as a touch contact for remotely located 1-Wire™ devices
- Together with DS2404S-C01 makes complex functions involving microcontrollers behave as if they were iButtons
- Available with "CERTIFIED DALLAS TOUCH" logo

### DESCRIPTION

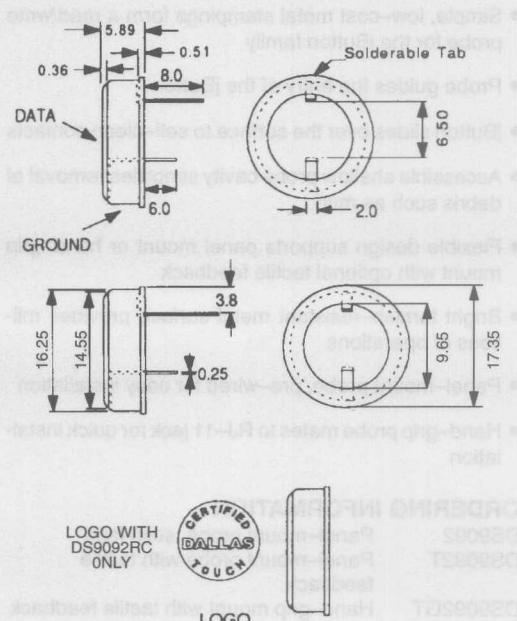
The DS9092R iButton Port provides the electrical contact necessary for mating remotely located iButtons or other 1-Wire MicroLAN devices with reader/writers. The DS9092R is also available with logo.

### APPLICATIONS



Equipment fitted with 1-Wire button contact.

### PACKAGE OUTLINE



All dimensions are shown in millimeters.

### CONTACTS

Rim	Ground
Inner Face	Data

### ORDERING INFORMATION

DS9092R	Tabbed F5 MicroCan
DS9092RC	Tabbed F5 MicroCan with logo

The DS9092 is available with a flat face plate (standard) or with optional tactile feedback. The center contact of the standard reader has no moving parts, making this a more rugged interface for harsh environments. This type of probe is best suited for designs where the iButton is brought into contact with the reader. The tactile feedback probe is ideal for situations where the iButton is stationary and the movable reader is brought in contact with it.



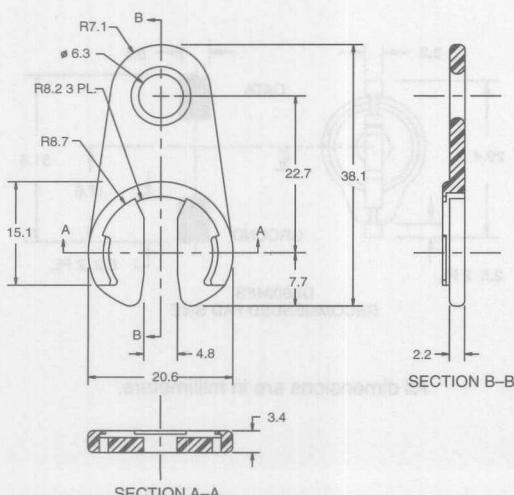
## DS9093x iButton™ Mount Products

### FEATURES

- Key ring mount version:
  - DS9093F snap-in fob for use with F5 MicroCan™
  - DS9093N angled fob for use with F5 MicroCan
  - DS9093A snap-in angled fob for use with F5 MicroCan
- Two permanent mount versions:
  - DS9093S allows an iButton to be easily and permanently attached to an object using screws or rivets (F5 MicroCan)
  - DS9093P has a locating pin and a single mounting hole for permanent attachment (F5 MicroCan)
- Prepundered hole mount:
  - DS9093RA lock ring firmly fastens F5 package
  - DS9093RB flange enlargement provides additional flange surface area if needed

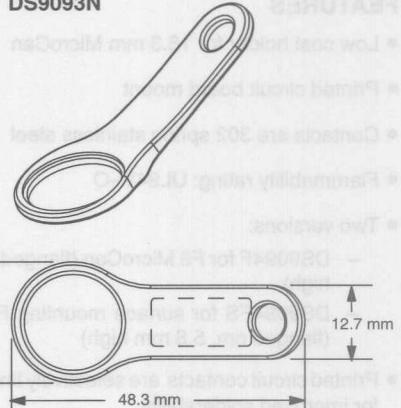
### KEY RING MOUNTS

#### DS9093F



All dimensions are in millimeters.

#### DS9093N



#### DS9093A



### DESCRIPTION

The DS9093 iButton Mount Products offer the user low-cost fixtures that hold an iButton for thumbpad applications or permanent attachment to an object.

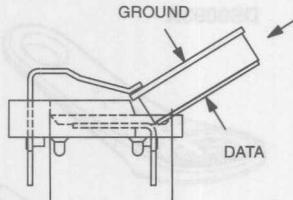
The DS9093F plastic snap-in fob offers the simplest way to mount an iButton for applications that require only momentary contact. The fob can be attached to a key ring for carrying. Do not apply solvents or adhesives to this fob. This might affect the mechanical strength and reliability.

**DALLAS**  
SEMICONDUCTOR

**DS9094**  
iButton™ Clip

## FEATURES

- Low cost holder for 16.3 mm MicroCan
- Printed circuit board mount
- Contacts are 302 spring stainless steel
- Flammability rating: UL94V-O
- Two versions:
  - DS9094F for F5 MicroCan (flanged rim, 5.8 mm high)
  - DS9094FS for surface mounting F5 MicroCan (flanged rim, 5.8 mm high)
- Printed circuit contacts are selectively tin-lead plated for improved solderability



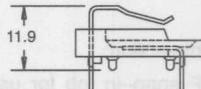
INSERTION OF iButton

## DESCRIPTION

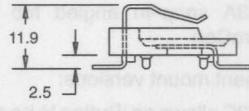
The DS9094 Clip holds an iButton and connects to a printed circuit board. By deflecting the spring clip in the molded housing, an iButton can be inserted and extracted without special tools. If reverse insertion is attempted, the beveled edge on the housing prevents contact. The DS9094's low profile minimizes the clearance height above the printed circuit board.

## NOTE:

Due to the large variation of cycles and temperatures in reflow ovens, it is recommended to experiment with this clip first before using it in production. If guaranteed compliance with the reflow soldering process is required, the DS9098 iButton Retainer should be preferred.

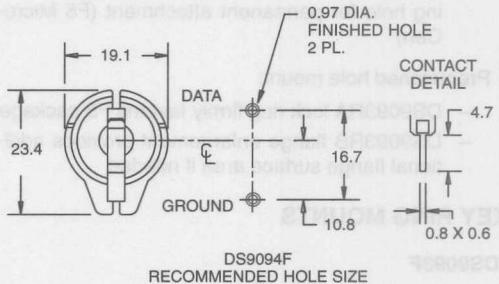


DS9094F

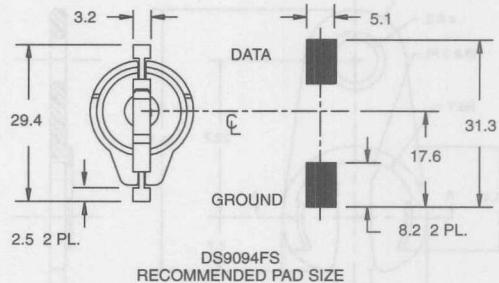


DS9094FS

## PC BOARD MOUNTING DETAILS



DS9094F  
RECOMMENDED HOLE SIZE



DS9094FS  
RECOMMENDED PAD SIZE

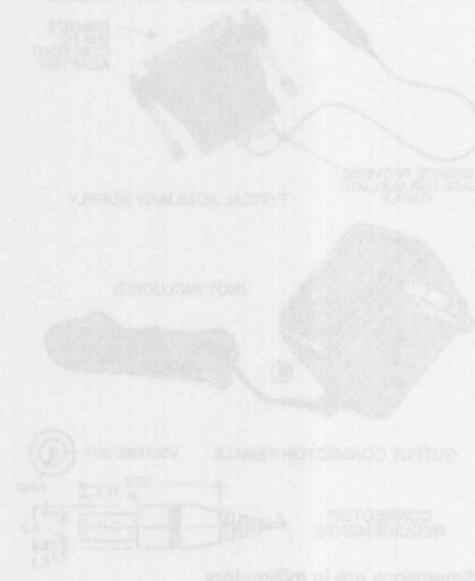
All dimensions are in millimeters.

**DALLAS**  
SEMICONDUCTOR

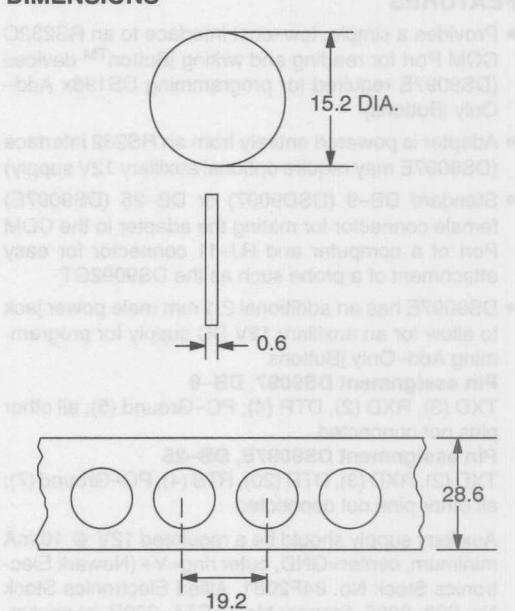
**DS9096P**  
**iButton™ Adhesive Pads**

## FEATURES

- Low-cost permanent attachment method for iButton
- Readily attaches iButton to any smooth flat surface
- Available in die-cut rolls of 500/roll



## DIMENSIONS



All dimensions are shown in millimeters.

## DESCRIPTION

The DS9096P iButton adhesive pad is a double-sided pad that is die-cut to match the diameter of iButton devices. The pads allow iButtons to be attached to virtually any smooth surface.

The DS9096P offers a very permanent attachment method that is not intended to be removed.

The DS9096P is designed for use with iButtons and MCR96 devices. It features a double-sided adhesive that allows it to be applied to a variety of surfaces, including metal, plastic, and wood. The adhesive is strong enough to hold the iButton in place even after repeated use. The adhesive is also waterproof, making it suitable for use in harsh environments.

The DS9096P is available in a variety of sizes, including 15.2 mm, 20.0 mm, and 25.4 mm. It is also available in a roll format, which makes it easy to apply to multiple surfaces. The adhesive is non-toxic and safe for use around children and pets.

# DALLAS SEMICONDUCTOR

## DS9097/DS9097E COM Port Adapter

### FEATURES

- Provides a simple, low-cost interface to an RS232C COM Port for reading and writing iButton™ devices (DS9097E required for programming DS198x Add-Only iButtons)
- Adapter is powered entirely from an RS232 interface (DS9097E may require optional auxiliary 12V supply)
- Standard DB-9 (DSD9097) or DB-25 (DS9097E) female connector for mating the adapter to the COM Port of a computer and RJ-11 connector for easy attachment of a probe such as the DS9092GT
- DS9097E has an additional 2.1 mm male power jack to allow for an auxiliary 12V DC supply for programming Add-Only iButtons

**Pin assignment DS9097, DB-9**

TXD (3), RXD (2), DTR (4), PC-Ground (5); all other pins not connected

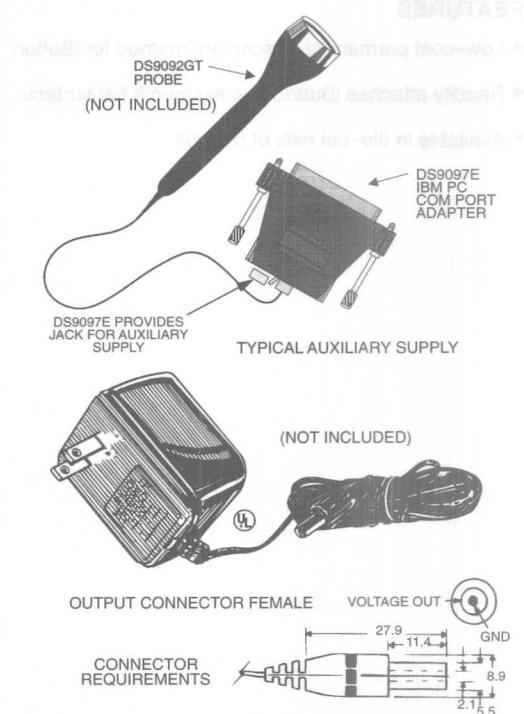
**Pin assignment DS9097E, DB-25**

TXD (2), RXD (3), DTR (20), RTS (4), PC-Ground (7); all other pins not connected

Auxiliary supply should be a regulated 12V @ 10 mA minimum, center=GND, outer ring=V+ (Newark Electronics Stock No. 84F2081, Allied Electronics Stock No. 928-9895, Stancor Model STA-300R, or equivalent)

### DESCRIPTION

The DS9097 COM Port Adapter is a simple, low-cost passive adapter which performs RS232C ( $\pm 12V$ ) level conversion, allowing an iButton probe to be connected to the serial port of a computer so that a non-EPROM iButton can be read and written directly. It can also read all EPROM-based iButtons. The serial port must support a data transmission rate of 115.2 kbits/s in order to create the 1-Wire™ time slots correctly. Nearly all PCs support the required bit rate and are fully compatible with the DS9097. Since an eight bit character (6 data bits plus start- and stop bit) on the RS232 bus operating at 115.2 kbits/s is used to form a single 1-Wire time slot, the maximum effective 1-Wire transfer rate is 14.4 kbits/s (regular speed). Details on the operation of the DS9097 including software examples are found in Application Note 74, Section V.



All dimensions are in millimeters.

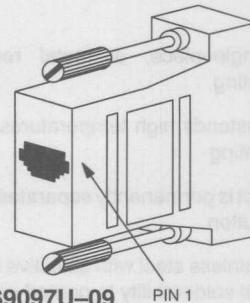
The DS9097E is an upgraded version of the DS9097 that is capable of supplying the 12 volts necessary to program the EPROM-based iButton products (DS198x Add-Only iButtons) in addition to reading and writing SRAM and EEPROM-based devices (DS199x, DS196x, DS197x). When combined with the appropriate software, the DS9097E can be used in a standalone mode where all of the programming current is supplied by the serial port itself. In this configuration, the maximum number of EPROM bits that can be programmed simultaneously is four on a typical serial port. For higher performance, the above mentioned 12V auxiliary supply can be plugged into the power jack on the DS9097E and with proper software enable the serial port to program up to eight EPROM bits simultaneously.



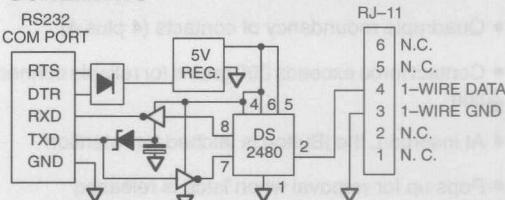
## DS9097U-09 Universal 1-Wire™ COM Port Adapter

### FEATURES

- True-ground interface to an RS232 COM Port for reading and writing iButton™ devices
- Works with bipolar logic signals of  $\pm 5V$  to  $\pm 12V$  (RS232C) as well as unipolar signals of 5V to 12V
- Supports reading and writing at regular and Overdrive Speed
- Provides strong pull-up to 5V for Temperature iButton, Crypto iButton and EEPROM iButton
- Communicates at data rates of 9.6k (default), 19.2k, 57.6k and 115.2k bits/s
- Adapter is powered entirely from an RS232 interface
- Standard DB-9 female connector for mating to the COM Port of a computer and 6-lead RJ-11 connector for easy attachment of standard MicroLAN Cables and probes



### SCHEMATIC



### ORDERING INFORMATION

DS9097U-09      DB-9 Connector

### DESCRIPTION

The DS9097U-09 is a sophisticated RS232 to 1-Wire Adapter which performs RS232 level conversion and actively generates the 1-Wire communication signals. Together with an adequate TMEX software driver it enables an IBM-compatible PC to directly read all and write any non-EEPROM iButton devices connected to the adapter. 1-Wire communication is supported by the adapter for regular as well as Overdrive speed. The serial port must support a data transmission rate of 9600 bits/s. Under software control, the adapter can be set up for RS232 data rates of 19200, 57600 and 115200 bits per second. The two higher rates are recommended for communication at Overdrive speed with Overdrive

capable devices connected to the 1-Wire bus. Since the DS9097U-09 operates in a byte mode, every data byte received from the RS232 port generates eight time slots on the 1-Wire bus. At 19200 bits/s data rate the DS9097U-09 is already faster than the DS9097(E) at 115200 bits/s.

The DS9097U-09 is based on the DS2480 Serial 1-Wire Line Driver chip and therefore is **not a plug-in replacement for the DS9097 or DS9097E**. The RXD/TXD Polarity Select input of the DS2480 is tied to Vdd (non-inverting).

**DALLAS**  
SEMICONDUCTOR

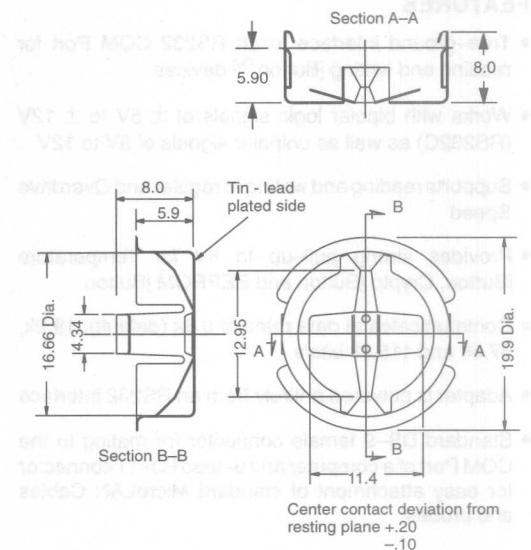
**DS9098**  
iButton™ Retainer

## FEATURES

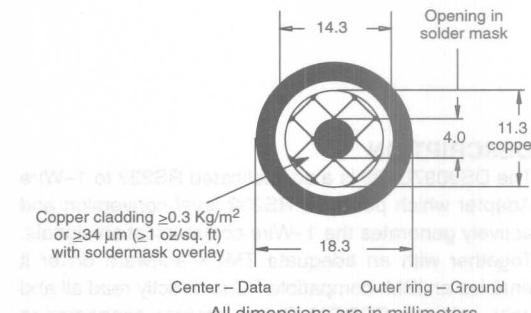
- Compact single-piece, all-metal receptacle for iButton mounting
- Retainer withstands high temperatures required for surface mounting
- Center contact is permanently separated at first insertion of the iButton
- Material is stainless steel with selective tin-lead plating for optimal solderability to printed circuit board
- Retainer to iButton connection is stainless steel to stainless steel
- Quadruple redundancy of contacts (4 plus 4)
- Contact force exceeds 200 grams for reliable connection
- At insertion, the iButton is latched for retention
- Pops up for removal when latch is released
- Gentle deflection of latches allows removal of the iButton
- >25 insertion/withdrawal cycles with no performance degradation
- Compatible with standard pick and place equipment; insensitive to angular orientation
- Cleaning fluids drain freely for quick clean up
- Available in bulk packaging (DS9098) or in extruded tube packaging (DS9098T)

## DESCRIPTION

The DS9098 iButton Retainer is a low-cost, surface mount device that retains a 16.3mm x 5.8mm MicroCan on a printed circuit board. The slender design secures the iButton for a compact printed circuit board mount. The retainer latches the flange of the iButton and prevents reversed insertion.



Recommended Printed Circuit  
Layout Pads



Center – Data      Outer ring – Ground  
All dimensions are in millimeters

## PRECAUTIONS ON USE

At first insertion closely align axis of the iButton and the Retainer, and then apply approximately 10 kg force for the separation of the center contacts. At subsequent insertion maintain similar axial alignment to avoid permanent deformation. At removal, limit deflection of retainer latches to just free the iButton edge from retained state. Avoid applying excess force to latches.

**DALLAS**  
SEMICONDUCTOR

## DS9100 Touch and Hold Probe Stampings

### FEATURES

- Compact two-piece, all-metal receptacle for F5 MicroCan™
- Accepts two thirds of the MicroCan – one third of MicroCan will extend out
- Allows reading iButtons with either momentary or dwelled contact
- Outer ring will hold MicroCan for dwelled contact
- Two options for data contact: cantilever (DS9100B) or coiled spring (DS9100C)
- >10000 insertion/withdrawal cycles with no performance degradation
- Redundancy of contacts and high contact force ensures reliability
- Probe withstands high temperatures required for PCB solder reflow operations
- Material is stainless steel with selective tin-lead plating for optimal solderability to printed circuit board
- Cleaning fluids drain freely for quick clean up

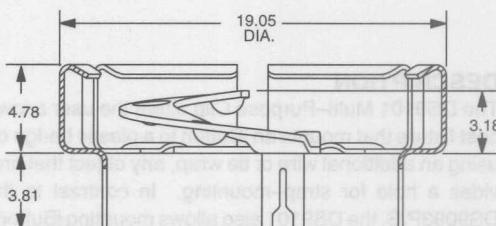
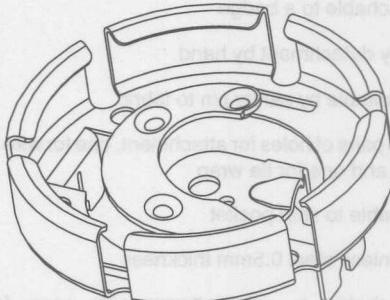
### ORDERING INFORMATION

DS9100A	Outer Contact (Ground)
DS9100B	Center Contact Cantilever (Data)
DS9100C	Center Contact Coiled Spring (Data)

### DESCRIPTION

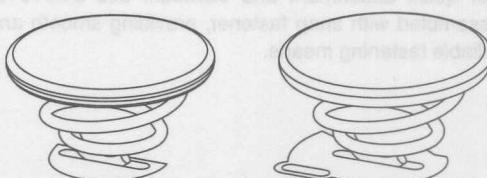
The DS9100 Touch and Hold Probe stampings function is similar to the DS9098 iButton Retainer. An F5 MicroCan will fit completely into the DS9098, but the flange and about one third of the can will extend out if pressed into the DS9100. As a probe, the DS9100A together with the coiled spring DS9100C allows reading iButtons on contact. With additional pressure, the stiff springs of the DS9100A's outer ring will deflect and grip the MicroCan sufficiently to provide a continuous contact to both the can rim (ground) and the can lid (data). If reading on contact is not required, the cantilever type center contact DS9100B can be used rather than the DS9100C.

### DS9100A WITH DS9100B



Dimensions are in millimeters

### DS9100C WITH CORRECT ORIENTATION TO SOLDER PAD



# DALLAS

## SEMICONDUCTOR

# DS9101

## Multi-Purpose Clip

### FEATURES

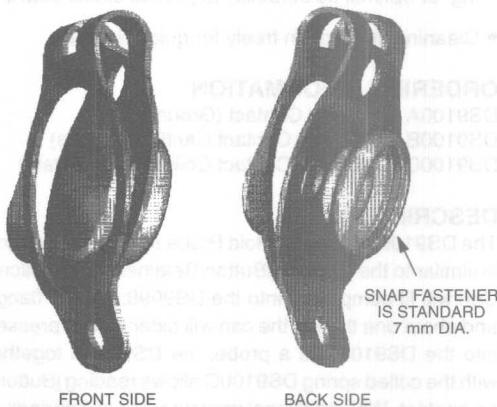
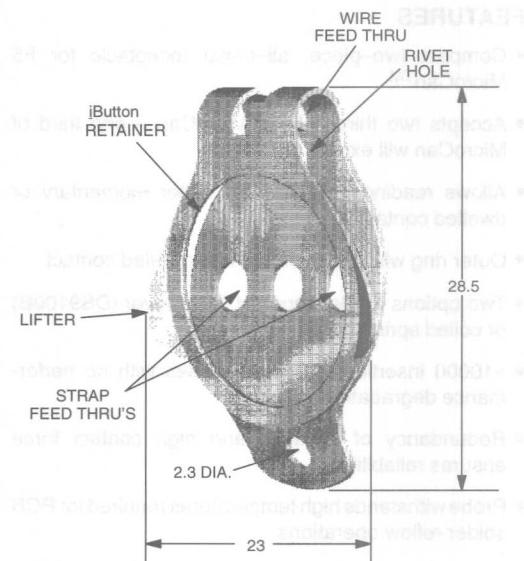
- Attachable to a badge
- Easy detachment by hand
- Mountable by safety pin to fabric
- Two pairs of holes for attachment, one for wire mounting, and one for tie wrap
- Clipable to shirt pocket
- Stainless steel 0.5mm thickness
- Attachable to other items with snap fastener (DS9101S)

### DESCRIPTION

The DS9101 Multi-Purpose Clip offers the user a low-cost fixture that mounts an iButton to a plastic badge or, using an additional wire or tie wrap, any object that provides a hole for strap-mounting. In contrast to the DS9093P/S, the DS9101 also allows mounting iButtons to bags or other soft surfaced objects.

The DS9101 is designed for easy attachment and detachment. Using a DS9093RA Lock Ring, the DS9101 can hold an iButton permanently and still allow all the flexibility of strap mounting.

For quick attachment and dismount use DS9101S, assembled with snap fastener, providing smooth and reliable fastening means.



DS9101S for snap fastening

Dimensions are shown in millimeters.

# DALLAS SEMICONDUCTOR

## DS9104 Digital Decoder Ring™

### FEATURES

- Digital information travels conveniently with the owner
- Hands-free data transfers
- Information can be updated on the fly
- Jewelry-grade stainless steel
- Full software support by iButton TMEX
- Compatible with Priva-C™ PC security system to prevent unauthorized use of computers running under DOS and WINDOWS
- Available with 64K-bit Memory iButton



ORDERING INFORMATION	
DS9104-060	ring size 6
DS9104-065	ring size 6 1/2
DS9104-070	ring size 7
DS9104-075	ring size 7 1/2
DS9104-080	ring size 8
DS9104-085	ring size 8 1/2
DS9104-090	ring size 9
DS9104-095	ring size 9 1/2
DS9104-100	ring size 10
DS9104-105	ring size 10 1/2
DS9104-110	ring size 11
DS9104-115	ring size 11 1/2
DS9104-120	ring size 12

### DESCRIPTION

The DS9104 Digital Decoder Ring brings jewelry into the information age. In its custom-designed setting it holds a Memory iButton with a unique, 64-bit serial number permanently engraved into the silicon chip inside plus 64K-bit of nonvolatile SRAM for virtually unlimited read and write cycles. For technical details on iButtons please refer to the Automatic Identification Data Book.

Applications of the Digital Decoder Ring include access control to buildings, personal information such as medi-



### ORDERING INFORMATION

DS9104-060	ring size 6
DS9104-065	ring size 6 1/2
DS9104-070	ring size 7
DS9104-075	ring size 7 1/2
DS9104-080	ring size 8
DS9104-085	ring size 8 1/2
DS9104-090	ring size 9
DS9104-095	ring size 9 1/2
DS9104-100	ring size 10
DS9104-105	ring size 10 1/2
DS9104-110	ring size 11
DS9104-115	ring size 11 1/2
DS9104-120	ring size 12

For a free order form including a ring sizer, please call (972) 371-6824 or send a Fax to (972) 371-3715.

cal records, business card data, private address, telephone list and access control to computers. Under iButton TMEX, files for all applications can reside in the same device without disturbing each other. The memory chip is formatted like a floppy disk and maintains a directory of files for random access.

Adapters for reading and writing iButtons through the parallel or serial port of IBM-compatible computers, the TMEX operating system and the Priva-C™ PC security system can be ordered for immediate shipment.

FEATURES

- Slides over iButton™ and highlights with a color
  - Color-coded tab accepts transparent computer generated label
  - Improves the visibility of the iButton for quick sighting
  - Available in six bright colors
  - 20 mm (DS9106S) and 60 mm (DS9106L) usable tail length for legends
  - Uses DS9096P adhesive pads for securing the tail
  - 1000 labels per bag

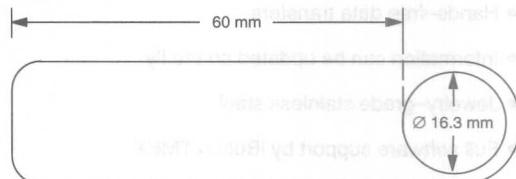
## **DESCRIPTION**

The DS9106 iButton Halos are 0.25 mm thin vinyl highlighters that slide over an iButton (Touch Memory) that is to be labeled with text, picture or numeric information. The halo is retained by a friction fit to the iButton it is pressed onto and one or two DS9096P double-sided adhesive pads.

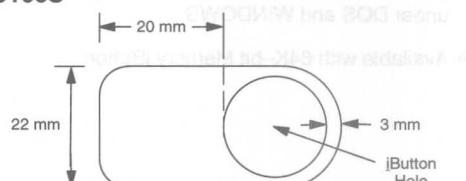
The halo itself is blank. Readable graphics are added using commercially available label printers such as the

## iBUTTON HALO TYPES

DS9106L



DS9106S



#### **ORDERING INFORMATION**

DS9106S-PK	iButton Halo, Pink 20 mm
DS9106S-OG	iButton Halo, Orange 20 mm
DS9106S-GN	iButton Halo, Green 20 mm
DS9106S-YL	iButton Halo, Yellow 20 mm
DS9106S-BL	iButton Halo, Blue 20 mm
DS9106S-WH	iButton Halo, White 20 mm
DS9106L-PK	iButton Halo, Pink 60 mm
DS9106L-OG	iButton Halo, Orange 60 mm
DS9106L-GN	iButton Halo, Green 60 mm
DS9106L-YL	iButton Halo, Yellow 60 mm
DS9106L-BL	iButton Halo, Blue 60 mm
DS9106L-WH	iButton Halo, White 60 mm

P-Touch series of products from BROTHER and the VARITRONICS EasyStep™ Label Printers. These manufacturers also offer software support for IBM and MAC compatible computers.

For best visibility and contrast, the labels should be printed black on transparent film. With their adhesive backing, they then mount on the fluorescent colored iButton Halo.



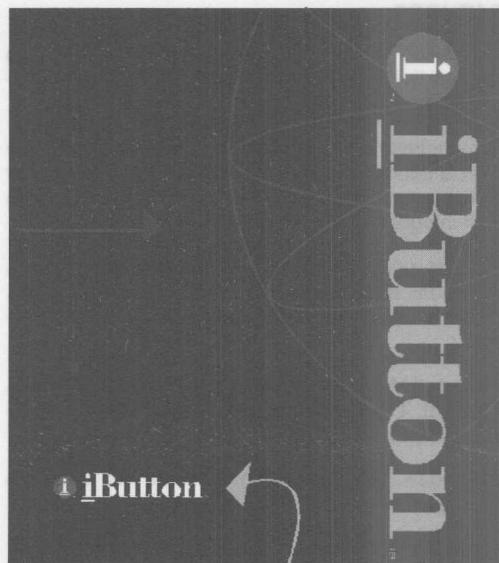
## DS0621-SDK iButton-TMEX™ Professional Software Developer's Kit: Version 3.10

### NEW FEATURES

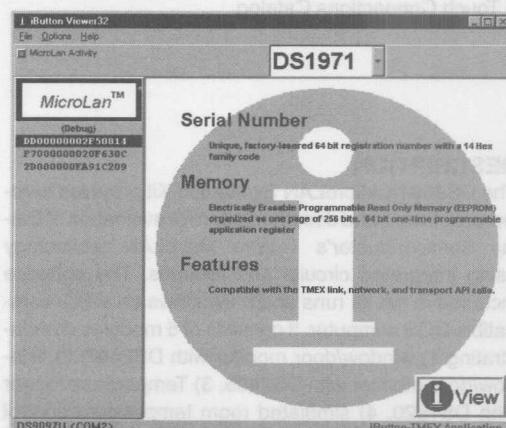
- Universal Serial Adapter (DS9097U and DS9097U-9) drivers for all supported platforms. This adapter has OverDrive and power-delivery capabilities and is based on the DS2480 Serial 1-Wire™ Line Driver.
- iButton-TMEX™ drivers for Windows CE 1.0.
- Microprocessor assembly examples in 8051, 6303, 808x (full API not supported).
- 15 new example iButton-TMEX applications.
- DS1963 Monetary-iButton support .

### FEATURES

- Easy Windows installation (3.1 or higher).
- Language-independent driver support for iButton-TMEX on Microsoft Windows 95, NT, 3.1, CE 1.0 and DOS.
- Includes source code example programs for Microsoft Windows (16 and 32 bit) written in C, Delphi(Pascal), and Visual Basic and examples for DOS written in C, Pascal, and Basic.
- TMEX™ provides API calls to locate and identify iButtons™, and to read and write TMEX Extended File Structure files.
- Includes iButton-TMEX driver installations for Windows 95/NT (32-bit), Windows 3.1 (16-bit), and DOS. Updates available over the Dallas Semiconductor World Wide Web site ([www.ibutton.com](http://www.ibutton.com)).
- Hyper-linked Windows Help files on the TMEX API and the source code examples.
- Full TMEX documentation in Adobe Acrobat (PDF) format on disk.
- OverDrive (accelerated) communication mode supported with the DS1410E parallel port adapter and DS9097U-9 serial port adapter with OverDrive capable iButtons.
- Supports all SRAM and EEPROM iButtons and reads all EPROM iButton devices up to 64K-bits with the DS1410E / DS1410D (parallel) and the DS9097U-9 / DS9097E / DS9097 (serial) adapters. EPROM programming is available with the DS9097E and DS9097U (serial) adapters.



### iButton VIEWER





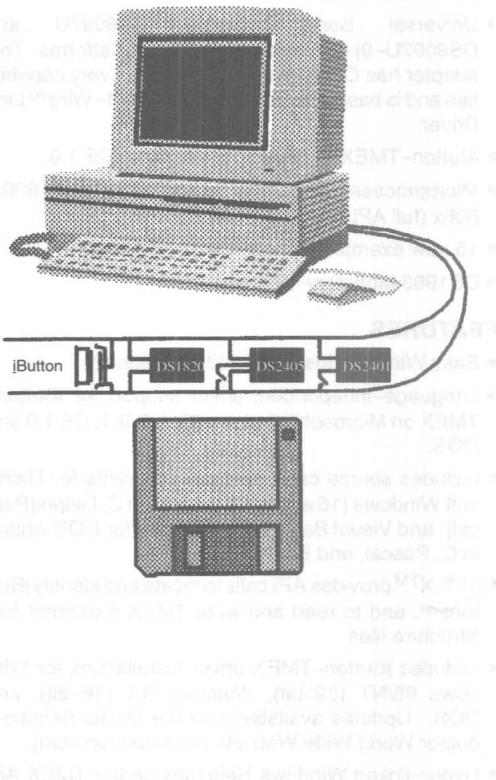
## DS9091K 1-Wire™ MicroLAN™ Evaluation Kit

### FEATURES

- Evaluation kit for 1-Wire MicroLAN networking through the serial port of an IBM PC-compatible computer
- 5 experiments of different complexity demonstrate typical MicroLAN applications such as window/door monitor, temperature monitor, burglar alarm system with integrated room temperature control
- Easy to understand manual explains experiments, communications protocol, MicroLAN components, theory of operation, interfacing and network optimization
- Featured MicroLAN components: DS2401, DS2405, DS1820, DS1990A, DS1993 and DS9097 Serial-Port adapter
- 3½" disk with evaluation software for Windows including C++ source code listings
- Book of DS19xx iButton Standards
- Automatic Identification Data Book
- Touch Connections Catalog

### DESCRIPTION

The DS9091K MicroLAN Evaluation Kit provides hardware, software and documentation for evaluation of Dallas Semiconductor's 1-Wire MicroLAN technology using integrated circuits and iButtons. The software included in the kit runs under Windows on a PC-compatible DOS computer. It consists of 5 modules demonstrating 1) window/door monitor with DS2401, 2) Window/door monitor with DS2405, 3) Temperature logger with DS1820, 4) simulated room temperature control with DS1820 and DS2405 and 5) burglar alarm system with simulated room temperature control. Each experiment can be expanded by simply adding more components available from Dallas Semiconductor.



The kit includes all special electrical and mechanical components required for the experiments. Not included are unshielded twisted pair cable, mechanical switches and a battery (4.5 or 6V). Experiments 4 and 5 allow controlling an electric heater and air conditioner. The relays for power switching are not included. For demonstration and electrical safety, these appliances are replaced by battery-operated LEDs.

Windows is a trademark of Microsoft Corporation.

**DALLAS  
SEMICONDUCTOR****DS9092K**  
**iButton™ Starter Kit****FEATURES**

- Starter Kit to help evaluate the iButton technology using an IBM compatible PC
- An assortment of iButton devices
- An assortment of iButton attachment accessories
- DS9092 iButton probe
- DS9092GT iButton Probe with Hand Grip
- DS9097E PC serial port adapter DB25 to RJ11 port
- Book of DS 19XX iButton Standards
- Data Sheets and application notes
- 3 1/2" disk with DOS demonstration software and utility functions
- iButton TMEX software compatible with DOS, Windows 3.1x and Windows 95/NT is downloadable from Dallas Semiconductors Web site  
<http://www.iButton.com/>

**DESCRIPTION**

The DS9092K iButton Starter Kit provides **basic** hardware and software for a quick evaluation of Dallas Semiconductor's iButton family, using an IBM compatible computer. The kit includes iButtons and demonstration software to easily communicate with the iButtons as well as an assortment of accessories.

The DS9092K is not intended for software developers and does not include run-time licenses. A Software Developer's Kit (DS0621-SDK) is available for software developers and more advanced users. The Developer's Kit does include callable routines and example programs.



## BATTERY MANAGEMENT

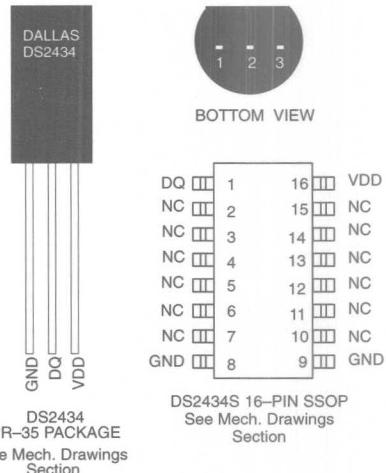


## DS2434 Battery Identification Chip

### FEATURES

- Provides unique ID number to battery packs
- Eliminates thermistors by sensing battery temperature on-chip
- 256-bit nonvolatile user memory available for storage of user data such as gas gauge and manufacturing information.
- Operating range of -40°C to +85°C
- Applications include portable computers, portable/cellular phones, consumer electronics, and handheld instrumentation.
- Surface mount package (209 MIL SSOP16) available

### PACKAGE OUTLINE



### PIN DESCRIPTION

GND	- Ground
DQ	- Data In/Out
V <sub>DD</sub>	- Supply Voltage
NC	- No Connect

### DESCRIPTION

The DS2434 Battery Identification Chip provides a convenient method of tagging and identifying battery packs by manufacturer, chemistry, or other identifying parameters. The DS2434 allows the battery pack to be coded with a unique identification number, and also store information regarding the battery life and charge/discharge characteristics in its nonvolatile memory.

The DS2434 also performs the essential function of monitoring battery temperature, without the need for a thermistor in the battery pack.

Information is sent to/from the DS2434 over a 1-Wire™ interface, so that battery packs need only have three output connectors; power, ground, and the 1-Wire interface.



# DS2435

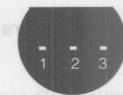
## Battery Identification Chip with Time/Temperature Histogram

### FEATURES

- Provides unique ID number to battery packs
- Eliminates thermistors by sensing battery temperature on-chip
- Elapsed time counter provides indication of battery usage/storage time
- Time/temperature histogram function provides essential information for determining battery self-discharge
- 256-bit nonvolatile user memory available for storage of user data such as gas gauge and manufacturing information.
- Operating range of -40°C to +85°C
- Applications include portable computers, portable/cellular phones, consumer electronics, and handheld instrumentation.

### PACKAGE OUTLINE

PR-35 PACKAGE



BOTTOM VIEW

See Mech. Drawings  
Section

### PIN DESCRIPTION

GND	- Ground
DQ	- Data In/Out
V <sub>DD</sub>	- Supply Voltage

### DESCRIPTION

The DS2435 Battery Identification Chip provides a convenient method of tagging and identifying battery packs by manufacturer, chemistry, or other identifying parameters. The DS2435 allows the battery pack to be coded with a unique identification number, and also store information regarding the battery life and charge/discharge characteristics in its nonvolatile memory.

The DS2435 also performs the essential function of monitoring battery temperature, without the need for a thermistor in the battery pack. A time/temperature histogram function stores the amount of time that the bat-

ter has been in up to eight temperature bands, allowing more accurate self-discharge calculations to be carried out by the user for determining remaining battery capacity. In addition, the on-board elapsed time counter provides a method of determining the amount of time that a battery pack has been in storage, to allow more accurate self-discharge determination.

Information is sent to/from the DS2435 over a 1-Wire™ interface, so that battery packs need only have three output connectors; power, ground, and the 1-Wire interface.

**DALLAS**  
SEMICONDUCTOR

# DS2436

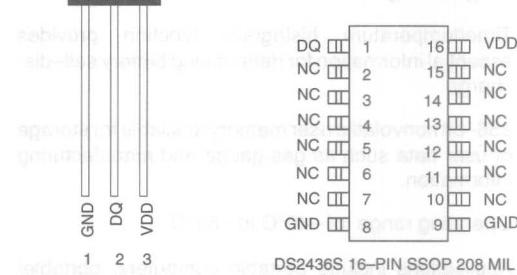
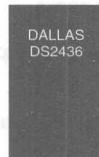
## Battery ID/Monitor Chip

### FEATURES

- On-board A/D converter monitors battery voltage for end-of-charge and end-of-discharge determination
- Eliminates thermistors by sensing battery temperature on-chip
- Provides unique ID number to battery packs
- 256-bit nonvolatile user memory available for storage of data such as fuel gauge and manufacturing information
- 2-byte cycle counter
- Operating range of -40°C to +85°C
- Applications include portable computers, portable/cellular phones, consumer electronics, and handheld instrumentation

### PACKAGE OUTLINE

PR35 PACKAGE

DS2436S 16-PIN SSOP 208 MIL  
See Mech. Drawings  
Section

### PIN DESCRIPTION

GND	- Ground
DQ	- Data In/Out
VDD	- Supply/Battery Connection

### DESCRIPTION

The DS2436 Battery Identification Chip provides a convenient method of tagging and identifying battery packs, by manufacturer, chemistry, or other identifying parameters. The DS2436 allows the battery pack to be coded with a unique, 2-byte identification number, and also store information regarding the battery life and charge/discharge characteristics in its nonvolatile memory.

The DS2436 also performs the essential function of monitoring battery temperature, without the need for a thermistor in the battery pack.

A cycle counter assists to determine the remaining cycle life of the battery.

Finally, the DS2436 measures battery voltage and sends that measured value to a host CPU, for use in end-of-charge or end-of-discharge determination, or basic fuel gauge operation.

Information is sent to/from the DS2436 over a 1-Wire™ interface, so that battery packs need only have three output connectors: power, ground, and the 1-Wire interface.



# DS2437

## Smart Battery Monitor

### FEATURES

- Unique 1-Wire™ interface requires only one port pin for communication
- Provides unique 64-bit serial number to battery packs
- Eliminates thermistors by sensing battery temperature on-chip
- On-board A/D converter allows monitoring of battery voltage for end-of-charge and end-of-discharge determination
- On-board integrated current accumulator facilitates gas gauging
- Real-time clock in binary format
- 40-byte nonvolatile user memory available for storage of user data such as gas gauge and manufacturing information
- Operating range -40°C to +85°C
- Applications include portable computers, portable/cellular phones, consumer electronics, and handheld instrumentation

### PIN ASSIGNMENT

DQ	1	16	VDD
NC	2	15	NC
VAD	3	14	NC
NC	4	13	X1
VSENS+	5	12	NC
VSENS-	6	11	X2
NC	7	10	NC
AGND	8	9	GND

16-PIN SSOP  
See Mech. Drawings  
Section

### PIN DESCRIPTION

DQ	- Data In/Out
VAD	- General A/D input
VSENS+	- Battery current monitor input (+)
VSENS-	- Battery current monitor input (-)
NC	- No connect
GND	- Digital Ground
AGND	- Analog Ground
X2	- Connection for 32.768 KHz XTAL
X1	- Connection for 32.768 KHz XTAL
VDD	- Power Supply (2.7V to 10.0V)

### DESCRIPTION

The DS2437 Smart Battery Monitor provides several functions that are desirable to carry in a battery pack: a means of tagging a battery pack with a unique serial number, a direct-to-digital temperature sensor which eliminates the need for thermistors in the battery pack, an A/D converter which measures the battery voltage and current, an integrated current accumulator, which keeps a running total of all current going into and out of the battery, a real-time clock, and 40 bytes of nonvolatile EEPROM memory for storage of important parameters such as battery capacity, capacity remaining, and indication of battery cycling.

Information is sent to/from the DS2437 over a 1-Wire interface, so that only one wire (and ground) needs to be connected from a central microprocessor to a DS2437. This means that battery packs need only have three output connectors: battery power, ground, and the 1-Wire interface.

Because each DS2437 contains a unique silicon serial number, multiple DS2437s can exist on the same 1-Wire bus. This allows multiple battery packs to be charged or used in the system simultaneously.



# CPU SUPERVISORS



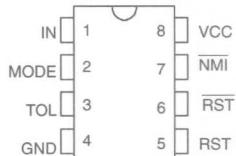
# DS1231/S

## Power Monitor Chip

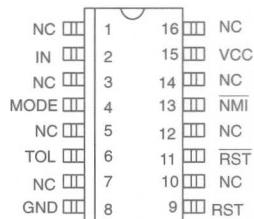
### FEATURES

- Warns processor of an impending power failure
- Provides time for an orderly shutdown
- Prevents processor from destroying nonvolatile memory during power transients
- Automatically restarts processor after power is restored
- Suitable for linear or switching power supplies
- Adjusts to hold time of the power supply
- Supplies necessary signals for processor interface
- Accurate 5% or 10%  $V_{CC}$  monitoring
- Replaces power-up reset circuitry
- No external capacitors required
- Optional 16-pin SOIC surface mount package

### PIN ASSIGNMENT



DS1231 8-Pin DIP  
(300 MIL)  
See Mech. Drawings  
Section



DS1231S 16-Pin SOIC  
(300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN	— Input
MODE	— Selects input pin characteristics
TOL	— Selects 5% or 10% $V_{CC}$ detect
GND	— Ground
RST	— Reset (Active High)
RST	— Reset (Active Low, open drain)
NMI	— Non-Maskable Interrupt
$V_{CC}$	— +5V Supply
NC	— No Connections

### DESCRIPTION

The DS1231 Power Monitor Chip uses a precise temperature-compensated reference circuit which provides an orderly shutdown and an automatic restart of a processor-based system. A signal warning of an impending power failure is generated well before regulated DC voltages go out of specification by monitoring high voltage inputs to the power supply regulators. If line isolation is required a UL-approved opto-isolator can be directly interfaced to the DS1231. The time for processor

shutdown is directly proportional to the available hold-up time of the power supply. Just before the hold-up time is exhausted, the Power Monitor unconditionally halts the processor to prevent spurious cycles by enabling Reset as  $V_{CC}$  falls below a selectable 5 or 10 percent threshold. When power returns, the processor is held inactive until well after power conditions have stabilized, safeguarding any nonvolatile memory in the system from inadvertent data changes.

**DALLAS**  
SEMICONDUCTOR

**DS1232**  
MicroMonitor Chip

## FEATURES

- Halts and restarts an out-of-control microprocessor
- Holds microprocessor in check during power transients
- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Accurate 5% or 10% microprocessor power supply monitoring
- Eliminates the need for discrete components
- Space-saving, 8-pin mini-DIP
- Optional 16-pin SOIC surface mount package
- Industrial temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  available, designated N

## DESCRIPTION

The DS1232 MicroMonitor Chip monitors three vital conditions for a microprocessor: power supply, software execution, and external override. First, a precision temperature-compensated reference and comparator circuit monitors the status of  $V_{CC}$ . When an out-of-tolerance condition occurs, an internal power fail signal is generated which forces reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signals are kept in the active state for a minimum of 250 ms to allow the power supply and processor to stabilize.

## PIN ASSIGNMENT

		PIN ASSIGNMENT									
PBRST		1 16 NC 2 15 VCC 3 14 NC 4 13 ST 5 12 NC 6 11 RST 7 10 NC 8 9 RST								PBRST	
TD		NC TD NC TOL GND								TD	
TOL		NC TOL GND								TOL	
GND		NC GND								GND	
VCC		8 VCC 7 ST 6 RST 5 RST								VCC	

DS1232 8-PIN DIP  
(300 MIL)

See Mech. Drawings  
Section

DS1232S 16-PIN SOIC  
(300 MIL)

See Mech. Drawings  
Section

## PIN DESCRIPTION

PBRST	– Pushbutton Reset Input
TD	– Time Delay Set
TOL	– Selects 5% or 10% $V_{CC}$ Detect
GND	– Ground
RST	– Reset Output (Active High)
RST	– Reset Output (Active Low, open drain)
ST	– Strobe Input
V <sub>CC</sub>	– +5 Volt Power
NC	– No Connections

The second function the DS1232 performs is pushbutton reset control. The DS1232 debounces the pushbutton input and guarantees an active reset pulse width of 250 ms minimum. The third function is a watchdog timer. The DS1232 has an internal timer that forces the reset signals to the active state if the strobe input is not driven low prior to time-out. The watchdog timer function can be set to operate on time-out settings of approximately 150 ms, 600 ms, and 1.2 seconds.

**DALLAS**  
SEMICONDUCTOR

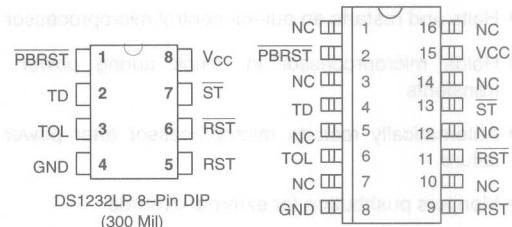
## DS1232LP/LPS

### Low Power MicroMonitor Chip

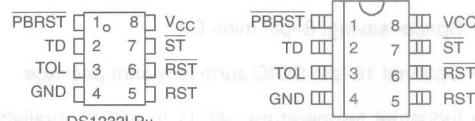
#### FEATURES

- Super low-power version of DS1232
- 50  $\mu$ A quiescent current
- Halts and restarts an out-of-control microprocessor
- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Accurate 5% or 10% microprocessor power supply monitoring
- 8-pin DIP, 8-pin SOIC or space saving  $\mu$ -SOP package available
- Optional 16-pin SOIC package available
- Industrial temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  available, designated N

#### PIN ASSIGNMENT



DS1232LPS 16-Pin SOIC  
(300 Mil)  
See Mech. Drawings  
Section



DS1232LPS 16-Pin  
SOIC  
(150 Mil)  
See Mech. Drawings  
Section

#### PIN DESCRIPTION

PBRST	— Pushbutton Reset Input
TD	— Time Delay Set
TOL	— Selects 5% or 10% $V_{CC}$ Detect
GND	— Ground
RST	— Reset Output (Active High)
$\overline{RST}$	— Reset Output (Active Low, open drain)
ST	— Strobe Input
$V_{CC}$	— +5 Volt Power

minimum of 250 ms to allow the power supply and processor to stabilize.

The second function the DS1232LP/LPS performs is pushbutton reset control. The DS1232LP/LPS debounces the pushbutton input and guarantees an active reset pulse width of 250 ms minimum. The third function is a watchdog timer.

#### DESCRIPTION

The DS1232LP/LPS Low Power MicroMonitor Chip monitors three vital conditions for a microprocessor: power supply, software execution, and external override. First, a precision temperature-compensated reference and comparator circuit monitors the status of  $V_{CC}$ . When an out-of-tolerance condition occurs, an internal power fail signal is generated which forces reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signals are kept in the active state for a

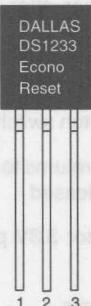
**DALLAS**  
SEMICONDUCTOR

**DS1233**  
5V EconoReset

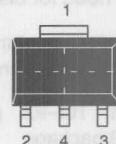
### FEATURES

- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Internal circuitry debounces pushbutton switch
- Maintains reset for 350 ms after  $V_{CC}$  returns to an in-tolerance condition or pushbutton released
- Accurate 5%, 10% or 15% microprocessor 5V power supply monitoring
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92 package or surface mount SOT-223 package
- Internal 5K $\Omega$  pull-up resistor
- Operating temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section



SOT-223 PACKAGE  
See Mech. Drawings  
Section

### PIN DESCRIPTION

PIN 1	GROUND
PIN 2	RESET
PIN 3	$V_{CC}$
PIN 4	GROUND (SOT-223 ONLY)

### DESCRIPTION

The DS1233 EconoReset monitors two vital conditions for a microprocessor: power supply and external override. A precision temperature compensated reference and comparator circuit are used to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is generated which forces reset to the active state. When

$V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 350 ms to allow the power supply and processor to stabilize. The second function of the DS1233 is pushbutton reset control. The DS1233 debounces a pushbutton closure and will generate a 350 ms reset pulse upon release.

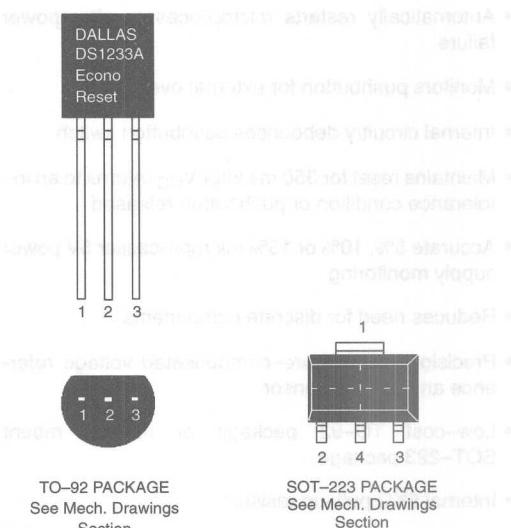
**DALLAS**  
SEMICONDUCTOR

**DS1233A**  
3.3V EconoReset

## FEATURES

- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Internal circuitry debounces pushbutton switch
- Maintains reset for 350 ms after  $V_{CC}$  returns to an in-tolerance condition or pushbutton released
- Accurate 10% or 15% microprocessor 3.3V power supply monitoring
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92 package or surface mount SOT-223 package
- Internal 5K $\Omega$  pull-up resistor
- Operating temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section

SOT-223 PACKAGE  
See Mech. Drawings  
Section

## PIN DESCRIPTION

PIN NUMBER	PIN DESCRIPTION
PIN 1	GND
PIN 2	RESET
PIN 3	$V_{CC}$
PIN 4	GND (SOT-223 ONLY)

## DESCRIPTION

The DS1233A EconoReset monitors two vital conditions for a microprocessor: power supply and external override. A precision temperature compensated reference and comparator circuit are used to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is generated which forces reset to the active state.

## DESCRIPTION

When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 350 ms to allow the power supply and processor to stabilize. The second function of the DS1233A is pushbutton reset control. The DS1233A debounces a pushbutton closure and will generate a 350 ms reset pulse upon release.

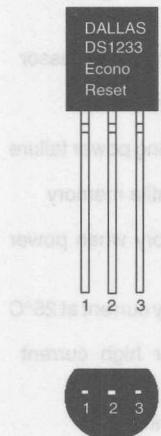
**DALLAS**  
SEMICONDUCTOR

**DS1233D**  
5V EconoReset

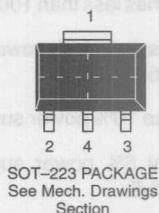
## FEATURES

- Automatically restarts microprocessor after power failure
- Maintains reset for 350 ms after  $V_{CC}$  returns to an in-tolerance condition
- Accurate 5%, 10% or 15% microprocessor 5V power supply monitoring
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92 package or surface mount SOT-223 package
- Internal 5K $\Omega$  pull-up resistor
- Compatible with Motorola 68XXX series and HC16 Microprocessors
- Operating temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section



SOT-223 PACKAGE  
See Mech. Drawings  
Section

## PIN DESCRIPTION

- |       |                       |
|-------|-----------------------|
| PIN 1 | GROUND                |
| PIN 2 | RESET                 |
| PIN 3 | $V_{CC}$              |
| PIN 4 | GROUND (SOT-223 ONLY) |

## DESCRIPTION

The DS1233D EconoReset uses a precision temperature compensated reference and comparator circuit to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is generated which forces reset to the active

state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 350 ms to allow the power supply and processor to stabilize.

**DALLAS**  
SEMICONDUCTOR

**DS1236**  
MicroManager Chip

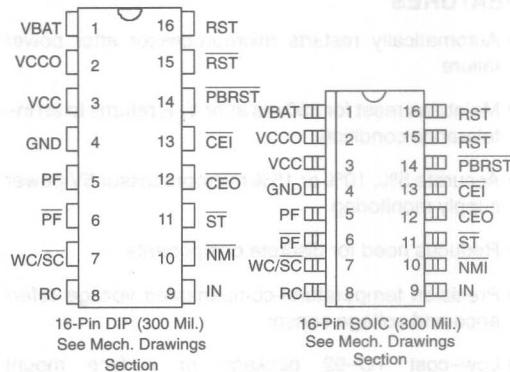
## FEATURES

- Holds microprocessor in check during power transients
- Halts and restarts an out-of-control microprocessor
- Monitors pushbutton for external override
- Warns microprocessor of an impending power failure
- Converts CMOS SRAM into nonvolatile memory
- Unconditionally write protects memory when power supply is out of tolerance
- Consumes less than 100 nA of battery current at 25°C
- Controls external power switch for high current applications
- Accurate 10% power supply monitoring
- Optional 5% power supply monitoring designated DS1236-5
- Provides orderly shutdown in nonvolatile microprocessor applications
- Supplies necessary control for low-power "stop mode" in battery operated hand-held applications
- Standard 16-pin DIP or space-saving 16-pin SOIC
- Optional industrial temperature range -40°C to +85°C

## DESCRIPTION

The DS1236 MicroManager Chip provides all the necessary functions for power supply monitoring, reset control, and memory backup in microprocessor-based systems. A precise internal voltage reference and comparator circuit monitor power supply status. When an out-of-tolerance condition occurs, the microprocessor reset and power fail outputs are forced active, and static RAM control unconditionally write protects external memory. The DS1236 also provides early warning detection of a user-defined threshold by driving a

## PIN ASSIGNMENT



## PIN DESCRIPTION

V <sub>BAT</sub>	- +3 Volt Battery Input
V <sub>CCO</sub>	- Switched SRAM Supply Output
V <sub>CC</sub>	- +5 Volt Power Supply Input
GND	- Ground
PF	- Power Fail (Active High)
PF	- Power Fail (Active Low)
WC/SC	- Wake-Up Control (Sleep)
RC	- Reset Control
IN	- Early Warning Input
NMI	- Non-Maskable Interrupt
ST	- Strobe Input
CEO	- Chip Enable Output
CEI	- Chip Enable Input
PBRST	- Pushbutton Reset Input
RST	- Reset Output (Active Low)
RST	- Reset Output (Active High)

non-maskable interrupt. External reset control is provided by a pushbutton reset input which is debounced and activates reset outputs. An internal watchdog timer can also force the reset outputs to the active state if the strobe input is not driven low prior to watchdog time-out. Reset control and wake-up/sleep control inputs also provide the necessary signals for orderly shutdown and start-up in battery backup and battery operated applications.

**DALLAS**  
SEMICONDUCTOR

# DS1236A

## MicroManager Chip

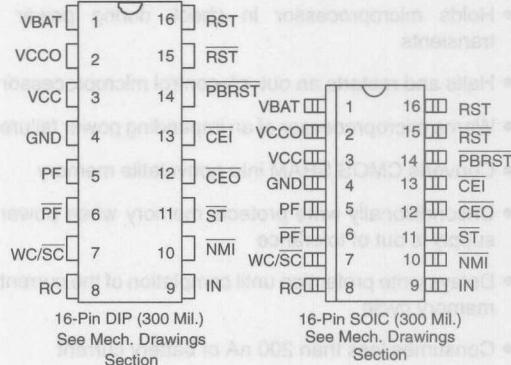
### FEATURES

- Holds microprocessor in check during power transients
- Halts and restarts an out-of-control microprocessor
- Monitors pushbutton for external override
- Warns microprocessor of an impending power failure
- Converts CMOS SRAM into nonvolatile memory
- Unconditionally write protects memory when power supply is out of tolerance
- Consumes less than 100 nA of battery current at 25°C
- Controls external power switch for high current applications
- Accurate 10% power supply monitoring
- Optional 5% power supply monitoring designated DS1236A-5
- Provides orderly shutdown in nonvolatile microprocessor applications
- Supplies necessary control for low-power "stop mode" in battery operated hand-held applications
- Standard 16-pin DIP or space-saving 16-pin SOIC
- Optional industrial temperature range -40°C to +85°C

### DESCRIPTION

The DS1236A MicroManager Chip provides all the necessary functions for power supply monitoring, reset control, and memory backup in microprocessor-based systems. A precise internal voltage reference and comparator circuit monitor power supply status. When an out-of-tolerance condition occurs, the microprocessor reset and power fail outputs are forced active, and static RAM control unconditionally write protects external memory. The DS1236A also provides early warning detection of a user-defined threshold by driving a

### PIN ASSIGNMENT



### PIN DESCRIPTION

V <sub>BAT</sub>	- +3 Volt Battery Input
V <sub>CCO</sub>	- Switched SRAM Supply Output
V <sub>CC</sub>	- +5 Volt Power Supply Input
GND	- Ground
PF	- Power Fail (Active High)
PF	- Power Fail (Active Low)
WC/SC	- Wake-Up Control (Sleep)
RC	- Reset Control
IN	- Early Warning Input
NMI	- Non-Maskable Interrupt
ST	- Strobe Input
CEO	- Chip Enable Output
CEI	- Chip Enable Input
PBRST	- Pushbutton Reset Input
RST	- Reset Output (Active Low)
RST	- Reset Output (Active High)

non-maskable interrupt. External reset control is provided by a pushbutton reset input which is debounced and activates reset outputs. An internal watchdog timer can also force the reset outputs to the active state if the strobe input is not driven low prior to watchdog time-out. Reset control and wake-up/sleep control inputs also provide the necessary signals for orderly shutdown and start-up in battery backup and battery operated applications.

**DALLAS**  
SEMICONDUCTOR

**DS1238**  
MicroManager

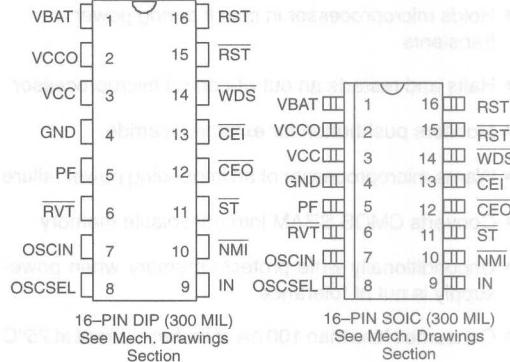
## FEATURES

- Holds microprocessor in check during power transients
- Halts and restarts an out-of-control microprocessor
- Warns microprocessor of an impending power failure
- Converts CMOS SRAM into nonvolatile memory
- Unconditionally write protects memory when power supply is out of tolerance
- Delays write protection until completion of the current memory cycle
- Consumes less than 200 nA of battery current
- Controls external power switch for high current applications
- Debounces pushbutton reset
- Accurate 10% power supply monitoring
- Optional 5% power supply monitoring designated DS1238-5
- Provides orderly shutdown in microprocessor applications
- Pin-for-pin compatible with MAX691
- Standard 16-pin DIP or space-saving 16-pin SOIC
- Optional industrial temperature range -40°C to +85°C

## DESCRIPTION

The DS1238 MicroManager provides all the necessary functions for power supply monitoring, reset control, and memory backup in microprocessor-based systems. A precise internal voltage reference and comparator circuit monitors power supply status. When an out-of-tolerance condition occurs, the microprocessor reset and power-fail outputs are forced active, and static RAM control unconditionally write protects external memory. The DS1238 also provides early warning detection of a user-defined threshold by driving a non-maskable interrupt. External reset control is provided

## PIN ASSIGNMENT



## PIN DESCRIPTION

- |                  |                               |
|------------------|-------------------------------|
| V <sub>BAT</sub> | - +3 Volt Battery Input       |
| V <sub>CCO</sub> | - Switched SRAM Supply Output |
| V <sub>CC</sub>  | - +5 Volt Power Supply Input  |
| GND              | - Ground                      |
| PF               | - Power Fail                  |
| RVT              | - Reset Voltage Threshold     |
| OSCIN            | - Oscillator In               |
| OSCSEL           | - Oscillator Select           |
| IN               | - Early Warning Input         |
| NMI              | - Non-Maskable Interrupt      |
| ST               | - Strobe Input                |
| CEO              | - Chip Enable Output          |
| CEI              | - Chip Enable Input           |
| WDS              | - Watchdog Status             |
| RST              | - Reset Output (active low)   |
| RST              | - Reset Output (active high)  |

by a pushbutton reset debounce circuit connected to the RST pin. An internal watchdog timer can also force the reset outputs to the active state if the strobe input is not driven low prior to watchdog timeout. Oscillator control pins OSCSEL and OSCIN provide either external or internal clock timing for both the reset pulse width and the watchdog timeout period. The Watchdog Status and Reset Voltage Threshold are provided via WDS and RVT, respectively.

**DALLAS**  
SEMICONDUCTOR

**DS1238A**  
MicroManager

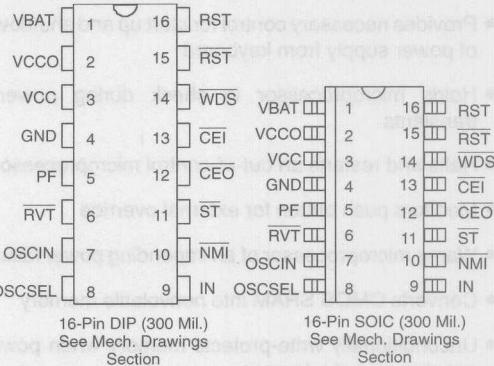
## FEATURES

- Holds microprocessor in check during power transients
- Halts and restarts an out-of-control microprocessor
- Warns microprocessor of an impending power failure
- Converts CMOS SRAM into nonvolatile memory
- Unconditionally write protects memory when power supply is out of tolerance
- Delays write protection until completion of the current memory cycle
- Consumes less than 200 nA of battery current
- Controls external power switch for high current applications
- Debounces pushbutton reset
- Accurate 10% power supply monitoring
- Optional 5% power supply monitoring designated DS1238A-5
- Provides orderly shutdown in microprocessor applications
- Pin-for-pin compatible with MAX691
- Standard 16-pin DIP or space-saving 16-pin SOIC
- Optional industrial temperature range -40°C to +85°C

## DESCRIPTION

The DS1238A MicroManager provides all the necessary functions for power supply monitoring, reset control, and memory backup in microprocessor-based systems. A precise internal voltage reference and comparator circuit monitor power supply status. When an out-of-tolerance condition occurs, the microprocessor reset and power fail outputs are forced active, and static RAM control unconditionally write protects external memory. The DS1238A also provides early warning detection of a user-defined threshold by driving a non-maskable interrupt. External reset control is provided

## PIN ASSIGNMENT



## PIN DESCRIPTION

V <sub>BAT</sub>	- +3 Volt Battery Input
V <sub>CCO</sub>	- Switched SRAM Supply Output
V <sub>CC</sub>	- +5 Volt Power Supply Input
GND	- Ground
PF	- Power Fail
RVT	- Reset Voltage Threshold
OSCIN	- Oscillator In
OSCSEL	- Oscillator Select
IN	- Early Warning Input
NMI	- Non-Maskable Interrupt
ST	- Strobe Input
CEO	- Chip Enable Output
CEI	- Chip Enable Input
WDS	- Watchdog Status
RST	- Reset Output (active low)
RST	- Reset Output (active high)

by a pushbutton reset debounce circuit connected to the RST pin. An internal watchdog timer can also force the reset outputs to the active state if the strobe input is not driven low prior to watchdog timeout. Oscillator control pins OSCSEL and OSCIN provide either external or internal clock timing for both the reset pulse width and the watchdog timeout period. The Watchdog Status and Reset Voltage Threshold are provided via WDS and RVT, respectively.

**DALLAS**  
SEMICONDUCTOR

**DS1239**  
MicroManager Chip

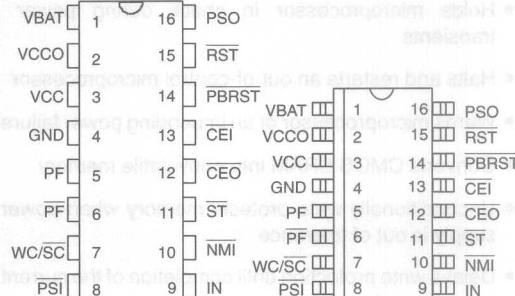
## FEATURES

- Provides necessary control for start up and shutdown of power supply from keyboard
- Holds microprocessor in check during power transients
- Halts and restarts an out-of-control microprocessor
- Monitors push button for external override
- Warns microprocessor of an impending power failure
- Converts CMOS SRAM into nonvolatile memory
- Unconditionally write-protects memory when power supply is out of tolerance
- Consumes less than 100 nA of battery current
- Controls external power switch for high current applications
- Accurate 10% power supply monitoring
- Optional 5% power supply monitoring designated DS1239-5
- Provides orderly shutdown in nonvolatile microprocessor applications
- Supplies necessary control for low-power "stop mode" in battery operate hand-held applications
- Standard 16-pin DIP or space-saving 16-pin SOIC
- Optional industrial temperature range, -40°C to +85°C

## DESCRIPTION

The DS1239 MicroManager provides all the necessary functions for power supply control and monitoring, reset control, and memory backup in microprocessor-based systems. Using the DS1239, an AC power switch is no longer required for microprocessor-based systems. A keyboard control system for power supply start up and shutdown is provided through the use of the Power Supply Control Input and Output. In other respects, the

## PIN ASSIGNMENT



DS1239 16-Pin DIP

(300 Mil)

See Mech. Drawings  
Section

DS1239 16-Pin SOIC

(300 Mil)

See Mech. Drawings  
Section

## PIN DESCRIPTION

V <sub>BAT</sub>	- +3 Volt Battery Input
V <sub>CCO</sub>	- Switched SRAM Supply Output
V <sub>CC</sub>	- +5 Volt Power Supply Input
GND	- Ground
PF	- Power Fail (Active High)
PF	- Power Fail (Active Low)
WC/SC	- Wake-Up Control (Sleep)
PSI	- Power Supply Control Input
IN	- Early Warning Input
NMI	- Non-Maskable Interrupt
ST	- Strobe Input
CEO	- Chip Enable Output
CEI	- Chip Enable Input
PBRST	- Pushbutton Reset Input
RST	- Reset Output (Active low)
PSO	- Power Supply Control Outputs

DS1239 is functionally identical to a DS1236 in the NMOS mode. For a complete description of the other DS1239 features, refer to the DS1236 data sheet. Pin-out of the DS1239 is identical to the DS1236 with two exceptions. The RC and RST pins have been replaced with PSI and PSO, respectively. Other pins and functions operate exactly as the DS1236 in NMOS mode.

**DALLAS**  
SEMICONDUCTOR

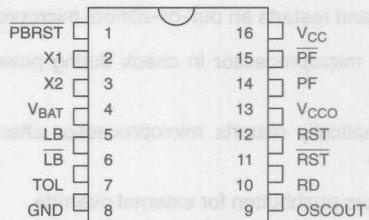
# DS1632

## PC Power Fail and Reset Controller

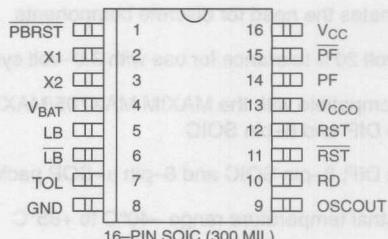
### FEATURES

- Power fail detector for personal computers and workstations
- Connects directly to popular personal computer chip sets
- On chip 32.768 kHz oscillator for real time clock
- Provides battery backup power to clock chip
- Pushbutton reset input
- Accurate 5% or 10% +5-volt power supply monitoring
- Complementary outputs for reset, power fail, and low battery
- Provides for reset pulse width of either 95 ms or 190 ms
- Eliminates the need for discrete components
- Low-power CMOS circuitry
- 16-pin DIP or SOIC surface mount package
- 0°C to 70°C operation

### PIN ASSIGNMENT



16-PIN DIP (300 MIL)  
See Mech. Drawings Section



16-PIN SOIC (300 MIL)  
See Mech. Drawings Section

### PIN DESCRIPTION

PBRST	— Pushbutton Reset Input
X1, X2	— Crystal Inputs
VBAT	— Battery Input
LB, LB	— Low Battery Outputs
RST, RST	— Reset Outputs
RD	— Reset Duration
TOL	— Selects 5% Or 10% Detection
GND	— Ground
OSCOUT	— Oscillator Out
Vcco	— Switched Power Out
PF, PF	— Power Fail Outputs
Vcc	— +5 Volt Power In

### DESCRIPTION

The DS1632 PC Power Fail and Reset Controller is designed to do various functions involving battery backup and other functions typically accomplished with discrete components. The DS1632 provides a 32.768 kHz battery backed up crystal oscillator and switched  $V_{CC}/V_{BAT}$  power via  $V_{CCO}$  for the real-time clock function located in accompanying chip sets. In addition, the DS1632 provides for reset on both power up and via pushbutton

input, power fail status signals for the processor, and low battery warning signals. The DS1632 is capable of detecting power failure at both the 5% and 10% power supply tolerances, and the reset pulse width can be set for either 95 ms or 190 ms. The device is designed to connect directly to popular laptop and notebook chip sets, which eliminates the need for discrete components and reduces cost.

**DALLAS**  
SEMICONDUCTOR

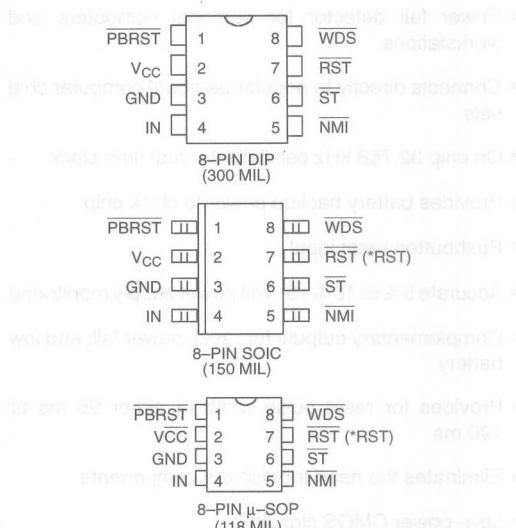
## DS1705/DS1706

### 3.3- and 5.0-Volt MicroMonitor

#### FEATURES

- Halts and restarts an out-of-control microprocessor
- Holds microprocessor in check during power transients
- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Accurate 5%, 10% or 20% resets for 3.3-volt systems and 5% or 10% resets for 5.0-volt systems
- Eliminates the need for discrete components
- 3.3-volt 20% tolerance for use with 3.0-volt systems
- Pin compatible with the MAXIM MAX705/MAX706 in 8-pin DIP and 8-pin SOIC
- 8-pin DIP, 8-pin SOIC and 8-pin μ-SOP packages
- Industrial temperature range -40°C to +85°C

#### PIN ASSIGNMENT



See Mech. Drawings  
Section

DS1705 and DS1706/\_R/S/T (\*DS1706L and DS1706P)

#### PIN DESCRIPTION

PBRST	Pushbutton Reset Input
V <sub>CC</sub>	Power Supply
GND	Ground
IN	Input
NMI	Non-maskable Interrupt
ST	Strobe Input
RST	Active Low Reset Output
*RST	Active High Reset Output (DS1706P and DS1706L only)
WDS	Watchdog Status Output

In a watchdog timer application, if the voltage at the device falls below a minimum threshold for a specified time period, a non-maskable interrupt is generated. As the voltage at the device degrades an internal power fail signal is generated which forces the reset to an active state. When V<sub>CC</sub> returns to an in-tolerance condition, the reset signal is kept in the active state for a minimum of 130 ms to allow the power supply and processor to stabilize.

#### DESCRIPTION

The DS1705/DS1706 3.3- or 5.0-Volt MicroMonitor monitors three vital conditions for a microprocessor: power supply, software execution, and external override. A precision temperature compensated reference and comparator circuit monitors the status of V<sub>CC</sub> at the device and at an upstream point for maximum protection. When the sense input detects an out-of-tolerance

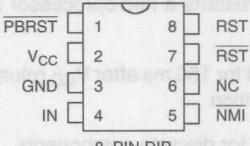
**DALLAS**  
SEMICONDUCTOR

## DS1707/DS1708 3.3— and 5.0—Volt MicroMonitor

### FEATURES

- Holds microprocessor in check during power transients
- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Accurate 5%, 10% or 20% resets for 3.3-volt systems and 5% or 10% resets for 5.0-volt systems
- Eliminates the need for discrete components
- 20% tolerance compatible with 3.0-volt systems
- Pin compatible with the MAXIM MAX707/MAX708 in 8-pin DIP and 8-pin SOIC packages
- 8-pin DIP, 8-pin SOIC and 8-pin μ-SOP packages available
- Industrial temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

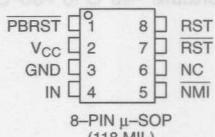
### PIN ASSIGNMENT



8-PIN DIP  
(300 MIL)



8-PIN SOIC  
(150 MIL)



8-PIN μ-SOP  
(118 MIL)

See Mech. Drawings  
Section

DS1707 and DS1708 /R/S/T

### PIN DESCRIPTION

PBRST	— Pushbutton Reset Input
V <sub>CC</sub>	— Power Supply
GND	— Ground
IN	— Input
NMI	— Non-maskable Interrupt
NC	— No Connect
RST	— Active Low Reset Output
RST	— Active High Reset Output

condition a non-maskable interrupt is generated. As the voltage at the device degrades an internal power fail signal is generated which forces the reset to an active state. When V<sub>CC</sub> returns to an in-tolerance condition, the reset signal is kept in the active state for a minimum of 130 ms to allow the power supply and processor to stabilize.

### DESCRIPTION

The DS1705/DS1706 3.3— or 5.0—Volt MicroMonitor monitors three vital conditions for a microprocessor: power supply, voltage sense, and external override. A precision temperature-compensated reference and comparator circuit monitors the status of V<sub>CC</sub> at the device and at an upstream point for maximum protection. When the sense input detects an out-of-tolerance

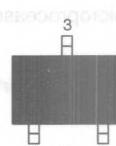
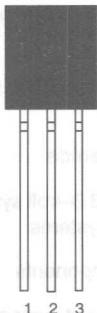
**DALLAS**  
SEMICONDUCTOR

**DS1810**  
5V EconoReset with Push-Pull Output

## FEATURES

- Automatically restarts a microprocessor after power failure
- Maintains reset for 150 ms after  $V_{CC}$  returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92 or space saving surface mount SOT-23 packages available
- Push-Pull output for low current operation
- Operating temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## PIN ASSIGNMENT



SOT-23 PACKAGE



TO-92 PACKAGE  
See Mech. Drawings  
Section

## PIN DESCRIPTIONS

### TO-92

1 RST	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

### SOT-23

1 RST	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

## DESCRIPTION

The DS1810 EconoReset uses a precision temperature reference and comparator circuit to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power-fail signal is

generated which forces reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

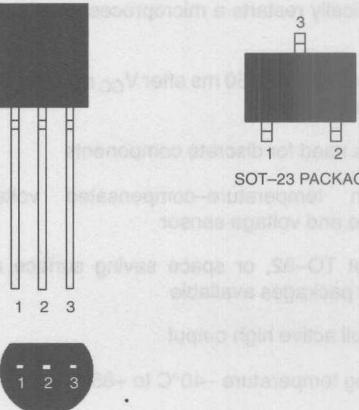
**DALLAS**  
SEMICONDUCTOR

**DS1811**  
5V EconoReset with Open Drain Output

## FEATURES

- Automatically restarts a microprocessor after power failure
- Maintains reset for 150 ms after  $V_{CC}$  returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92 or space saving SOT-23 packages available
- Efficient open-drain output with internal  $5.5\text{ k}\Omega$  pull-up resistor
- Operating temperature  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$

## PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section

## PIN DESCRIPTIONS

### TO-92

1 $\overline{\text{RST}}$	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

### SOT-23

1 $\overline{\text{RST}}$	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

## DESCRIPTION

The DS1811 EconoReset uses a precision temperature reference and comparator circuit to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power-fail signal is

generated which forces reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

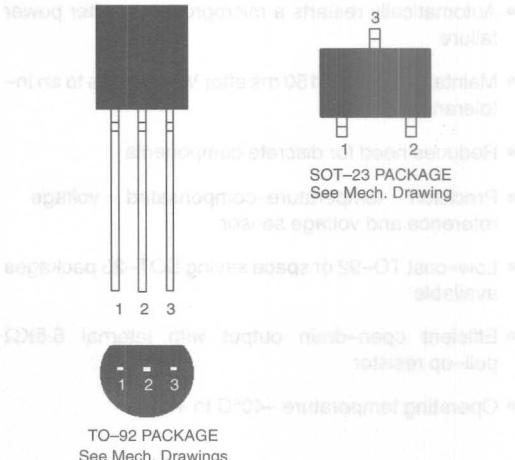
**DALLAS**  
SEMICONDUCTOR

## DS1812 5V EconoReset with Active High Push-Pull Output

### FEATURES

- Automatically restarts a microprocessor after power failure
- Maintains reset for 150 ms after V<sub>CC</sub> returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92, or space saving surface mount SOT-23 packages available
- Push-Pull active high output
- Operating temperature -40°C to +85°C

### PIN ASSIGNMENT



### PIN DESCRIPTIONS

#### TO-92

- |                   |                          |
|-------------------|--------------------------|
| 1 RST             | Active High Reset Output |
| 2 V <sub>CC</sub> | Power Supply             |
| 3 GND             | Ground                   |

#### SOT-23

- |                   |                          |
|-------------------|--------------------------|
| 1 RST             | Active High Reset Output |
| 2 V <sub>CC</sub> | Power Supply             |
| 3 GND             | Ground                   |

### DESCRIPTION

The DS1812 EconoReset uses a precision temperature reference and comparator circuit to monitor the status of the power supply (V<sub>CC</sub>). When an out-of-tolerance condition is detected, an internal power-fail signal is

generated which forces reset to the active state. When V<sub>CC</sub> returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.



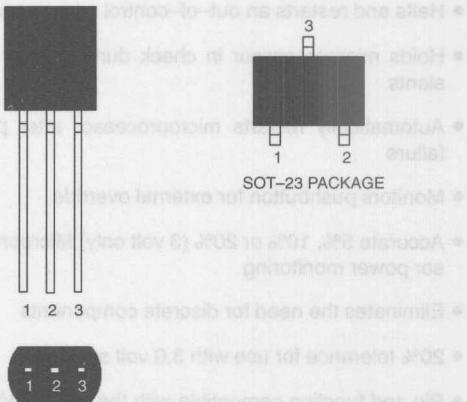
# DS1813

## 5V EconoReset with Pushbutton

### FEATURES

- Automatically restarts a microprocessor after power failure
- Monitors pushbutton for external override
- Maintains reset for typically 150 ms after V<sub>CC</sub> returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92 or space saving surface-mount SOT-23 packages available
- Efficient open-drain output with internal 5.5kΩ pull-up resistor
- Operating temperature -40°C to +85°C

### PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section

### PIN DESCRIPTIONS

#### TO-92

		FUNCTION	PACKAGE
1	RST	Active Low Reset Output	DS1813A
2	V <sub>CC</sub>	Power Supply	DS1813B
3	GND	Ground	DS1813C

#### SOT-23

		FUNCTION	PACKAGE
1	RST	Active Low Reset Output	DS1813A
2	V <sub>CC</sub>	Power Supply	DS1813B
3	GND	Ground	DS1813C

### DESCRIPTION

The DS1813 EconoReset uses a precision temperature reference and comparator circuit to monitor the status of the power supply (V<sub>CC</sub>). When an out-of-tolerance condition is detected, an internal power-fail signal is generated which forces reset to the active state. When V<sub>CC</sub> returns to an in-tolerance condition, the reset sig-

nal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

The DS1813 also monitors a pushbutton on the reset output. If the reset line is pulled low, a reset is generated upon release and will be held in reset output low for typically 150 ms.

# DALLAS SEMICONDUCTOR

## DS1814/DS1819 5 Volt and 3.3 Volt EconoMonitor

### FEATURES

- Halts and restarts an out-of-control microprocessor
- Holds microprocessor in check during power transients
- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Accurate 5%, 10% or 20% (3 volt only) Microprocessor power monitoring
- Eliminates the need for discrete components
- 20% tolerance for use with 3.0 volt systems
- Pin and function compatible with the MAX823/24/25 products
- Low cost SOT-23-5 package
- Industrial temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

DEVICE	<u>RST</u>	RST	PBRST	WD
DS181xA	X		X	X
DS181xB	X	X		X
DS181xC	X	X	X	

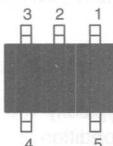
X = '4' for 5 volt devices

X = '9' for 3 volt devices

### DESCRIPTION

The DS1705/DS1706 5 volt EconoMonitor and the DS1819 3.3 volt EconoMonitor monitors three vital conditions for a microprocessor: power supply, software execution, and external override. First, a precision temperature compensated reference and comparator circuit monitors the status of  $V_{CC}$ . When an out-of-tolerance condition occurs, an internal power fail signal is generated which forces the reset(s) to an active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for a minimum of 140 ms to allow the power supply and processor to stabilize.

### PIN ASSIGNMENT



SOT-23-5 PACKAGE  
See Mech. Drawing

### PIN DESCRIPTION

DS181xA

1 <u>RST</u>	Active Low Reset Output
2 GND	Ground
3 PBRST	Pushbutton Reset Input
4 ST	Strobe Input
5 VCC	Power Supply

DS181xB

1 RST	Active Low Reset Output
2 GND	Ground
3 RST	Active High Reset Output
4 ST	Strobe Input
5 VCC	Power Supply

DS181xC

1 RST	Active Low Reset Output
2 GND	Ground
3 RST	Active High Reset Output
4 PBRST	Pushbutton Reset Input
5 VCC	Power Supply

The DS1814/DS1819 'A' and 'C' perform pushbutton reset control. They debounce the pushbutton input and generate an active reset pulse width of 140 ms minimum. The DS1814/9 'A' and 'B' versions perform a watchdog function. The watchdog is an internal timer that forces the reset signals to the active state if the strobe input does not change state every 1.12 seconds. The watchdog timer function can be disabled by leaving the watchdog strobe input unconnected.

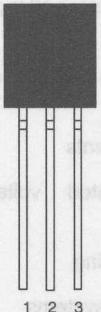
**DALLAS**  
SEMICONDUCTOR

# DS1815 3.3V EconoReset with Push-Pull Output

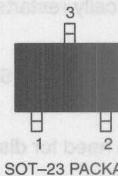
## FEATURES

- Automatically restarts a microprocessor after power failure
- Maintains reset for 150 ms after  $V_{CC}$  returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Accurate 10% or 20% power monitoring
- Low-cost TO-92 or space saving surface-mount SOT-23 packages available
- Push-Pull output for low current operation
- Operating temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section



SOT-23 PACKAGE



TO-92 PACKAGE  
See Mech. Drawings  
Section

## PIN DESCRIPTIONS

### TO-92

1 RST	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

### SOT-23

1 RST	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

## DESCRIPTION

The DS1815 EconoReset uses a precision temperature reference and comparator circuit to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is

generated which forces reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

**DALLAS**  
SEMICONDUCTOR

## DS1816

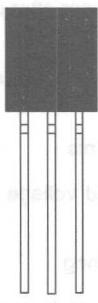
### 3.3V EconoReset with Open Drain Output

#### FEATURES

- Automatically restarts a microprocessor after power failure
- Maintains reset for 150 ms after  $V_{CC}$  returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Accurate 10% or 20% power monitoring
- 20% tolerance for use with 3.0 volt systems
- Low-cost TO-92 or space saving SOT-23 packages available
- Efficient open-drain output with internal 5 K $\Omega$  pull-up resistor
- Operating temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

#### THEMIS DS1816

#### PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section

#### SUMMARY

The DS1816 is a precision temperature compensated voltage reference and voltage sensor designed to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is generated which forces the reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize. The DS1816 is a low-cost alternative to the DS1811 EconoReset with its space saving SOT-23 package.

#### PIN DESCRIPTIONS

##### TO-92

1 RST	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

##### SOT-23

1 RST	Active Low Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

#### DESCRIPTION

The DS1816 EconoReset uses a precision temperature reference and comparator circuit to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is

generated which forces reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

**DALLAS**  
SEMICONDUCTOR

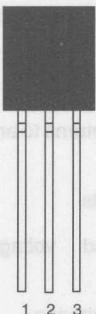
**DS1817**

Active High 3.3V EconoReset

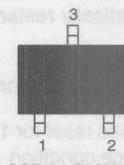
## FEATURES

- Automatically restarts a microprocessor after power failure
- Maintains reset for 150 ms after  $V_{CC}$  returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Accurate 10% or 20% power monitoring
- 20% tolerance for use with 3.0 volt systems
- Low-cost TO-92 or space saving surface mount SOT-23 packages available
- Push-Pull active high output
- Operating temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings



SOT-23 PACKAGE  
See Mech. Drawing

## PIN DESCRIPTIONS

### TO-92

1 RST	Active High Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

### SOT-23

1 RST	Active High Reset Output
2 $V_{CC}$	Power Supply
3 GND	Ground

## DESCRIPTION

The DS1817 EconoReset uses a precision temperature reference and comparator circuit to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is

generated which forces reset to the active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

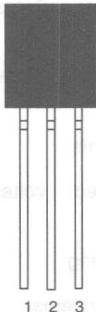
**DALLAS**  
SEMICONDUCTOR

**DS1818**  
3.3V EconoReset with Pushbutton

## FEATURES

- Automatically restarts a microprocessor after power failure
- Monitors pushbutton for external override
- Maintains reset for 150 ms after V<sub>CC</sub> returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Accurate 5%, 10% or 20% power monitoring
- Low-cost TO-92 or space saving surface mount SOT-23 packages available
- Efficient open-drain output with internal 5.5kΩ pull-up resistor
- Operating temperature -40°C to +85°C

## PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section

## DESCRIPTION

### DESCRIPTION

The DS1818 EconoReset uses a precision temperature compensated reference and comparator circuit to monitor the status of the power supply (V<sub>CC</sub>). When an out-of-tolerance condition is detected, an internal power fail signal is generated which forces reset to the active

## PIN DESCRIPTIONS

### TO-92

1 RST	Active Low Reset Output
2 V <sub>CC</sub>	Power Supply
3 GND	Ground

### SOT-23

1 RST	Active Low Reset Output
2 V <sub>CC</sub>	Power Supply
3 GND	Ground

state. When V<sub>CC</sub> returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

**DALLAS**  
SEMICONDUCTOR

## DS1830 Programmable MicroMonitor

### FEATURES

- Halts and restarts an out-of-control microprocessor
- Holds microprocessor in check during power transients
- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Major function parameters programmable through simple 3-wire interface, stored in nonvolatile memory
- Reset time programmable from 5 ms to 2.5 seconds
- Watchdog timeout programmable from 25 ms to 12.5 seconds
- Power trip points programmable 4.75V to 2.7V
- Pin compatible with the DS1232
- Low cost 8-pin DIP and 8-pin SOIC packages available
- Operating temperature of -40°C to +85°C

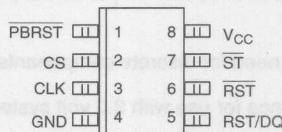
### DESCRIPTION

The DS1830 Programmable MicroMonitor monitors three vital conditions for a microprocessor: power supply, software execution, and external override. All monitored parameters are programmable, with values stored in nonvolatile EPROM. This allows parameters such as reset time, watchdog timeout period, and power supply tolerance to be programmed into the device and tailored

### PIN ASSIGNMENT



DS1830 8-PIN DIP  
(300 MIL)  
See Mech. Drawing  
Pg. 480



DS1830 8-PIN SOIC  
(150 MIL)  
See Mech. Drawing  
Pg. 483

### PIN DESCRIPTION

PBRST	- Pushbutton Reset Input
CS	- Chip Select for Serial Port
CLK	- Clock for Serial Port
GND	- Ground
RST/DQ	- Active High Reset Output/Serial Data Input
RST	- Active Low Reset Output
ST	- Strobe Input
V <sub>CC</sub>	- Power Supply

The DS1830 is a high performance, low cost, programmable microprocessor monitor. It monitors three vital conditions for a microprocessor: power supply, software execution, and external override. All monitored parameters are programmable, with values stored in nonvolatile EPROM. This allows parameters such as reset time, watchdog timeout period, and power supply tolerance to be programmed into the device and tailored to the application circuit and microprocessor which is to be monitored.

In addition, the watchdog timer, reset, and pushbutton functions may be disabled via software. This allows maximum flexibility for use in new product development and system application testing.

**DALLAS**  
**SEMICONDUCTOR**

## DS1832 3.3 Volt MicroMonitor Chip

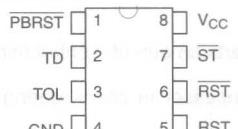
### FEATURES

- Halts and restarts an out-of-control microprocessor
- Holds microprocessor in check during power transients
- Automatically restarts microprocessor after power failure
- Monitors pushbutton for external override
- Accurate 10% or 20% microprocessor power monitoring
- Eliminates need for discrete components
- 20% tolerance for use with 3.0 volt systems
- Pin compatible with the DS1232
- Low cost 8-pin DIP, 8-pin SOIC, and space saving  $\mu$ -SOP packages available
- Industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

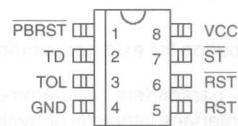
### DESCRIPTION

The DS1832 3.3 Volt MicroMonitor monitors three vital conditions for a microprocessor: power supply, software execution, and external override. First, a precision temperature-compensated reference and comparator circuit monitors the status of  $V_{CC}$ . When an out-of-tolerance condition occurs, an internal power fail signal is generated which forces the resets to an active state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signals are kept in the active state for a minimum of 250 ms to allow the power supply and processor to stabilize.

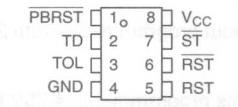
### PIN ASSIGNMENT



DS1832 8-PIN DIP (300 MIL)  
See Mech. Drawings Section



DS1832S 8-PIN SOIC (150 MIL)  
See Mech. Drawings Section



DS1232 $\mu$  8-PIN  $\mu$ -SOP (118 MIL)  
See Mech. Drawings Section

### PIN DESCRIPTION

PBRST	— Pushbutton Reset Input
TD	— Time Delay Set
TOL	— Selects 10% or 20% $V_{CC}$ Detect
GND	— Ground
RST	— Active High Reset Output
RST	— Active Low Reset Output
ST	— Strobe Input
V <sub>CC</sub>	— Power Supply

The second function the DS1832 performs is pushbutton reset control. The DS1832 debounces the pushbutton input and guarantees an active reset pulse width of 250 ms minimum. The third function is a watchdog timer. The DS1832 has an internal timer that forces the reset signals to the active state if the strobe input is not driven low prior to time-out. The watchdog timer function can be set to operate on time-out settings of approximately 150 ms, 600 ms, or 1.2 seconds.

**DALLAS**  
SEMICONDUCTOR

**DS1833**  
5V EconoReset

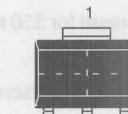
## FEATURES

- Automatically restarts microprocessor after power failure
- Maintains active-high reset for 350 ms after  $V_{CC}$  returns to an in-tolerance condition
- Accurate 5%, 10% or 15% microprocessor 5V power supply monitoring
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Low-cost TO-92 package or surface mount SOT-223 package
- Internal 5K pull-up resistor
- Operating temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## PIN ASSIGNMENT



TO-92 PACKAGE  
See Mech. Drawings  
Section



SOT-223 PACKAGE  
See Mech. Drawings  
Section

## PIN DESCRIPTION

- |       |                       |
|-------|-----------------------|
| Pin 1 | Ground                |
| Pin 2 | Reset                 |
| Pin 3 | $V_{CC}$              |
| Pin 4 | Ground (SOT-223 only) |

## DESCRIPTION

The DS1833 EconoReset uses a precision temperature compensated reference and comparator circuit to monitor the status of the power supply ( $V_{CC}$ ). When an out-of-tolerance condition is detected, an internal power fail signal is generated which forces reset to the active

(high) state. When  $V_{CC}$  returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 350 ms to allow the power supply and processor to stabilize.

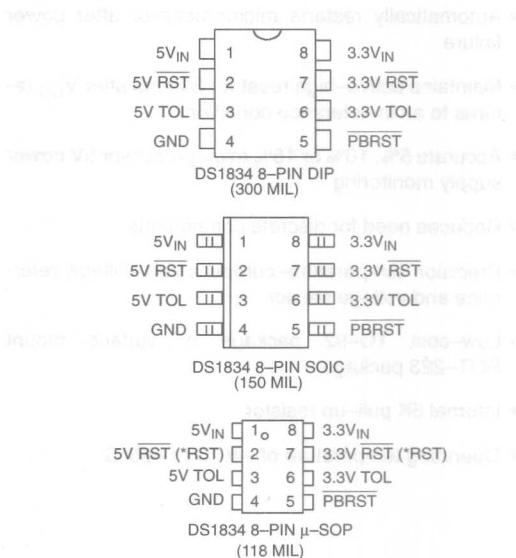
**DALLAS**  
SEMICONDUCTOR

## DS1834/A/D Dual EconoReset with Pushbutton

### FEATURES

- 5 volt power-on reset
- 3.3 volt power-on reset
- Internal power is drawn from higher of either the 5V IN input or the 3.3V IN input
- Excellent for systems designed to operate with dual power supplies
- Asserts resets during power transients
- Pushbutton reset input for system override
- Maintains reset for 350 ms after  $V_{CC}$  returns to an intolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- 8-pin DIP, 8-pin SOIC, and 8-pin  $\mu$ -SOP available
- CMOS output for low current operation on the DS1834 and DS1834D
- Operating temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### PIN ASSIGNMENT



### PIN DESCRIPTION

5V <sub>IN</sub>	— 5V Power Supply Input
5V RST (*RST)	— 5V Reset Output
5V TOL	— Selects 5V Input Tolerance
GND	— Ground
PBRST	— Pushbutton Reset
3.3V TOL	— Selects 3.3V Input Tolerance
3.3V RST (*RST)	— 3.3V Reset Output
3.3V <sub>IN</sub>	— 3.3V Power Supply Input

\*DS1834D Active High Reset

### DESCRIPTION

The DS1834 Dual EconoResets monitors three vital system conditions: 5 volt supply, 3.3 volt supply, and an external override. First a precision temperature reference and comparator circuit monitors the status of the 5 volt supply and the 3.3 volt supply. When an out-of-tolerance condition is detected, an internal power fail

signal is generated which forces the reset of the affected supply to an active state. Lastly, the DS1834 supports an external debounce pushbutton input. When the pushbutton is pulled low both resets will be asserted for approximately 350 ms after the pushbutton is released.

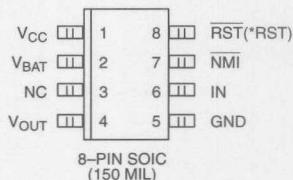
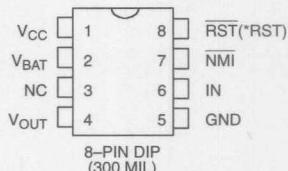
**DALLAS**  
SEMICONDUCTOR

## DS1836A/B/C/D 3.3V/5V MicroManager

### FEATURES

- 5-volt or 3.3-volt power-on reset
- True 3-volt operation power switch
- Switches to battery at 3.8 volts (2.6 volts for 3.3-volt versions)
- Excellent for systems designed to operate with dual power supplies
- Asserts resets during power transients
- Maintains reset for 350 ms after  $V_{CC}$  returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- 8-pin DIP or space saving 8-pin SOIC surface mount available
- CMOS reset output for low current operation
- Operating temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Perfect for PIC microprocessor applications

### PIN ASSIGNMENT



DS1836A/C (\*DS1836B/D)

### PIN DESCRIPTION

$V_{CC}$	— Power Supply Input
$V_{BAT}$	— Battery Supply Input
NC	— No Connect
$V_{OUT}$	— Power Supply Output
GND	— Ground
IN	— Sense Input
NMI	— Non-maskable Interrupt
$\overline{RST}(*RST)$	— Reset Output

### DESCRIPTION

The DS1836 MicroManager performs three vital system functions. First, a precision temperature-compensated reference and comparator circuit monitors the status of the voltage on  $V_{CC}$  and when an out-of-tolerance condition is detected, an internal power fail signal is generated which forces the reset active. If  $V_{CC}$  continues to degrade it switches to the battery supply when  $V_{CC}$  drops below 3.8 volts (2.6 volts for 3.3-volt ver-

sions). When  $V_{CC}$  exceeds 3.9 volts (2.8 volts for 3.3-volt versions),  $V_{OUT}$  will again be supplied from  $V_{CC}$ . Reset will remain active for 350 ms after  $V_{CC}$  returns to an in-tolerance condition.

Lastly, the DS1836 supports a sense input that sends a non-maskable interrupt whenever the sense input drops below 1.25 volts.



## USB Audio DAC

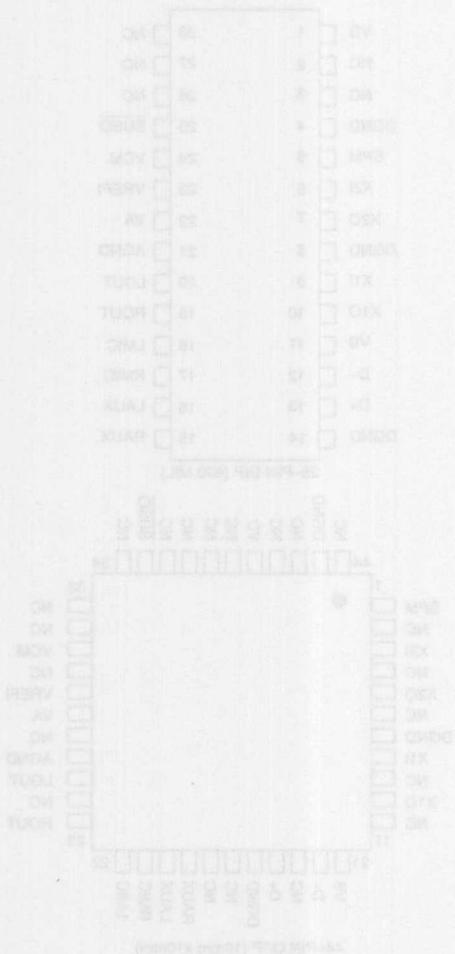
# DIGITAL AUDIO

SEVENSEAS SEMICONDUCTOR

THE WORLD'S FIRST 16-BIT 192-KHz USB 2.0 CLASS II DOP DAC

WITH 128-MHZ SPUR-FREE DAC, 100-MHZ ADC, AND 128-MHZ USB

### KEY ASSIGNMENT



• Full USB Class-Digital Class-A/D Conversion

• Class-D Stereo DAC Block

• 16-Bit DAC

• Analog Power Filter

• 44.1, 100, & 192 KHz Sampling Rates

• >90 dB SNR DAC Performance

• Video Synchronizer Functionality

• Integrated USB Controller Interface

• High Rate 12 Mbps USB Interface

• Analog Output Mode for Analog Inputs

• Multiple Power Configuration Using On-Chip Selection

• USB Power

• 5.0V – 9.0V Operating Range

### OVERVIEW

The DS90U0101 is a high performance, low功耗, 16-bit digital-to-analog converter (DAC) designed for high-fidelity audio applications. It features a unique combination of a high performance DAC and a high performance ADC in a single package. The DAC is capable of 192 kHz sampling rates and has a dynamic range of over 90 dB. The ADC is capable of 44.1 kHz sampling rates and has a dynamic range of over 90 dB. The DS90U0101 also features a built-in digital-to-digital converter (DDC) and a built-in digital-to-analog converter (DAC). The DS90U0101 is a high performance, low功耗, 16-bit digital-to-analog converter (DAC) designed for high-fidelity audio applications. It features a unique combination of a high performance DAC and a high performance ADC in a single package. The DAC is capable of 192 kHz sampling rates and has a dynamic range of over 90 dB. The ADC is capable of 44.1 kHz sampling rates and has a dynamic range of over 90 dB. The DS90U0101 also features a built-in digital-to-digital converter (DDC) and a built-in digital-to-analog converter (DAC).

16-Bit single-code DAC and high resolution DSD playback  
designed for stereo audio. The DS90U0101 is designed  
specifically for USB digital audio applications.



# DS4201

## USB Audio DAC

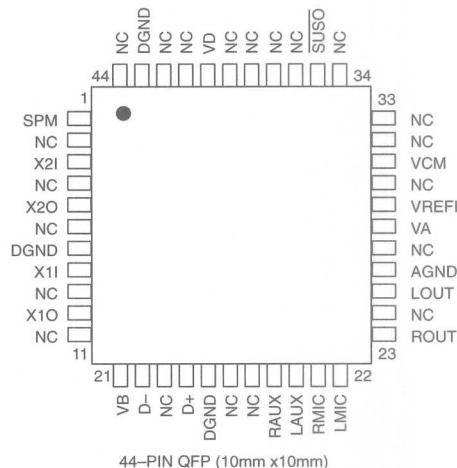
### FEATURES

- Fully USB Core Class v1.0 Compliant
- Fully USB Audio Device Class v1.0 Compliant
- Complete Stereo DAC System
- 16-bit  $\Sigma\Delta$  DAC
- Analog Post Filter
- 44.1 KHz, 48 KHz Sampling Rates
- >80 dB S/N DAC Performance
- Audio System Power Management
- 8 and 16-Bit PCM Digital Data Formats
- Integrated USB Compliant Transceiver
- High Rate 12 Mbps USB Interface
- Analog Output Mixing for Auxiliary Inputs
- Multiple Power Configurations Including Completely USB Powered
- 3.3V – 5.0V Operating Range

### PIN ASSIGNMENT

VD	1	28	NC
NC	2	27	NC
NC	3	26	NC
DGND	4	25	SUSO
SPM	5	24	VCM
X2I	6	23	VREFI
X2O	7	22	VA
DGND	8	21	AGND
X1I	9	20	LOUT
X1O	10	19	ROUT
VB	11	18	LMIC
D-	12	17	RMIC
D+	13	16	LAUX
DGND	14	15	RAUX

28-PIN DIP (600 MIL)



### OVERVIEW

#### DESCRIPTION

The DS4201 Universal Serial Bus (USB) audio device is a complete interface solution for USB based PC digital audio playback. Integrating a USB device core, stereo

16-bit sigma-delta DAC and fixed function DSP processing, as shown in Figure 1, the DS4201 is designed specifically for USB digital speaker implementations.

## DIGITAL POTENTIOMETERS



# DS1267

## Dual Digital Potentiometer Chip

### FEATURES

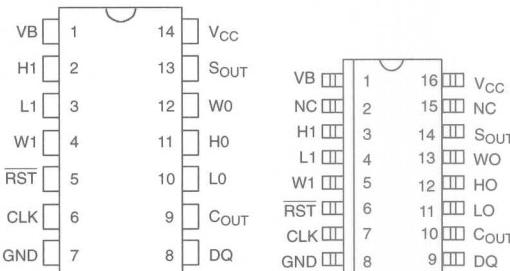
- Ultra low power consumption, quiet, pumpless design
- Two digitally controlled, 256-position potentiometers
- Serial port provides means for setting and reading both potentiometers
- Resistors can be connected in series to provide increased total resistance
- 14-pin DIP, 16-pin SOIC, 20-pin TSSOP packages
- Resistive elements are temperature compensated to  $\pm 0.3$  LSB relative linearity
- Standard resistance values:
  - DS1267-10 ~ 10K $\Omega$
  - DS1267-50 ~ 50K $\Omega$
  - DS1267-100 ~ 100K $\Omega$
- Temperature:
  - Commercial: 0°C to 70°C
  - Industrial: -40°C to 85°C

### DESCRIPTION

The DS1267 consists of two digitally controlled solid-state potentiometers. Each potentiometer is composed of 256 resistive sections. Between each resistive section and both ends of the potentiometer are tap points which are accessible to the wiper. The position of the wiper on the resistive array is set by an 8-bit value that controls which tap point is connected to the wiper output. Communication and control of the device are accomplished via a 3-wire serial port interface. This interface allows the device wiper position to be read or written.

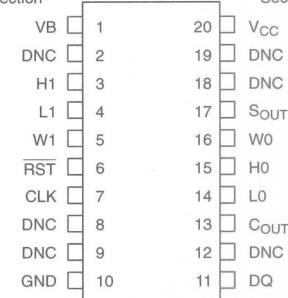
Both potentiometers can be connected in series (or stacked) for an increased total resistance with the same resolution. For multiple device single processor environments, the DS1267 can be cascaded or daisy chained. This feature provides for control of multiple devices over a single 3-wire bus.

### PIN ASSIGNMENT



14-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section



20-PIN TSSOP (173 MIL)

### PIN DESCRIPTION

L0, L1	- Low End of Resistor
H0, H1	- High End of Resistor
W0, W1	- Wiper Terminal of Resistor
V <sub>B</sub>	- Substrate Bias Voltage
S <sub>OUT</sub>	- Stacked Configuration Output
RST	- Serial Port Reset Input
DQ	- Serial Port Data Input
CLK	- Serial Port Clock Input
C <sub>OUT</sub>	- Cascade Port Output
V <sub>CC</sub>	- +5 Volt Supply
GND	- Ground
NC	- No Internal Connection
DNC	- Do Not Connect

**DALLAS**  
SEMICONDUCTOR

## DS1666, DS1666S Audio Digital Resistor

### FEATURES

- 128 position, digitally controlled potentiometer
- Operates from a +5-volt power supply with TTL signal inputs
- Wide analog voltage range of  $\pm 5$  volts
- Resistive elements are temperature compensated to  $\pm 20$  percent end to end
- Low-power CMOS
- 14-pin DIP or 16-pin SOIC for surface mount applications
- Default position on power up sets wiper position at 10%
- Operating temperature range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  (industrial)

	Resolution/Step		
Resistance values	Low End	High End	-3dB Point
DS1666-10	10K $\Omega$	24 $\Omega$	152 $\Omega$
DS1666-50	50K $\Omega$	122 $\Omega$	759 $\Omega$
DS1666-100100K $\Omega$	243 $\Omega$	1.519K $\Omega$	100 kHz

### DESCRIPTION

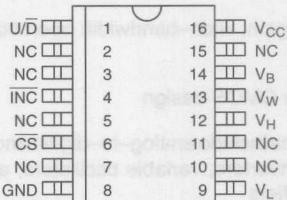
The DS1666 is a solid-state potentiometer which is set to value by digitally controlled resistive elements. The potentiometer is composed of 127 resistive sections. Between each resistive section and both ends of the potentiometer are TAP points accessible to the wiper. The position of the wiper on the resistance array is controlled by the CS, U/D and INC inputs. The position of the wiper defaults to the 10% position on power-up. The resolution of the DS1666 is shown in Figure 1.

### PIN ASSIGNMENT



14-PIN DIP (300 MIL)

See Mech. Drawings Section



16-PIN SOIC (300 MIL)

See Mech. Drawings Section

### PIN DESCRIPTION

V <sub>H</sub>	— High Terminal of Resistor
V <sub>L</sub>	— Low Terminal of Resistor
V <sub>W</sub>	— Wiper Terminal of Resistor
U/D	— Up/Down Control
INC	— Wiper Movement Control
CS	— Chip Select for Wiper Movement
NC	— No Connection
V <sub>CC</sub>	— +5 Volts
GND	— Ground
V <sub>B</sub>	— 0 to $-5$ Volts

The DS1666 Digital Audio Resistor is uniquely designed to provide a potentiometer that is logarithmic rather than linear across its entire range. The lower half of the potentiometer advances 1% of total resistance for each 3% of scale advanced, providing for precise amplification of low volume signals. The upper half of the potentiometer advances 2% of resistance for every 1% of scale advanced, providing for the lower resolution gain required for high volume amplification.

**DALLAS**  
SEMICONDUCTOR

# DS1667

## Digital Resistor with OP AMP

### FEATURES

- Two digitally controlled 256-position potentiometers
- Serial port provides means for setting and reading both potentiometers
- Resistors can be connected in series to provide additional resolution
- Default wiper position on power up is 50%
- Resistive elements are temperature compensated to  $\pm 20\%$  end-to-end
- Two high-gain, wide-bandwidth operational amplifiers
- Low power CMOS design
- Applications include analog-to-digital and digital-to-analog converters, variable oscillators, and variable gain amplifiers
- 20-pin DIP package or optional 20-pin SOIC surface mount package
- Operating temperature range of 0°C to 70°C
- Resistance Values

		RESOLUTION	-3 dB POINT
DS1667-10:	10K	39 ohms	1.1 MHz
DS1667-50:	50K	195 ohms	200 kHz
DS1667-100:	100K	390 ohms	100 kHz

### DESCRIPTION

The DS1667 is a dual solid-state potentiometer that is adjustable by digitally selected resistive elements. Each potentiometer is composed of 256 resistive elements. Between each resistive section of each potentiometer are tap points accessible to the wiper. The position of the wiper on the resistive array is set by an 8-bit register that controls which tap point is connected to the wiper output. Each 8-bit register can be read or written by sending or receiving data bits over a 3-wire serial port. In addition, the resistors can be stacked such that

### PIN ASSIGNMENT



20-PIN DIP (300 MIL) and 20-PIN SOIC  
See Mech. Drawings Section

### PIN DESCRIPTION

V <sub>CC</sub>	+5 Volt Supply
GND	Ground
L0, L1	Low End of Resistor
H0, H1	High End of Resistor
W0, W1	Wiper End of Resistor
V <sub>B</sub>	Substrate Bias and OP AMP
	Negative Supply
SOUT	Wiper for Stacked Configuration
RST	Serial Port Reset Input
DQ	Serial Port Input/Output
CLK	Serial Port Clock Input
COUT	Cascade Serial Port Output
NINV0, NINV1	Noninverting OP AMP Input
INV0, INV1	Inverting OP AMP Input
OUT0, OUT1	OP AMP Outputs

a single potentiometer of 512 sections results. When two separate potentiometers are used, the resolution of the DS1667 is equal to the resistance value divided by 256. When the potentiometers are stacked end to end, the resistance value is doubled while the resolution remains the same. The DS1667 also contains two high gain wide bandwidth operational amplifiers. Each amplifier has both the inverting and non-inverting inputs and the output available for user configuration.

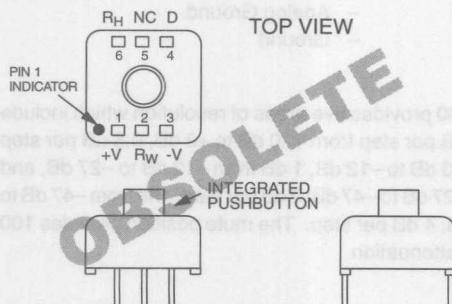
**DALLAS**  
SEMICONDUCTOR

**DS1668, DS1669, DS1669S**  
Dallastat™ Electronic Digital Rheostat

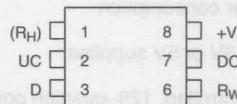
### FEATURES

- Replaces mechanical variable resistors
- Available as the DS1668 with manual interface or the DS1669 integrated circuit
- Human engineered interface provides easy control with DS1668
- Electronic interface provided for digital as well as manual control
- Wide differential input voltage range between 4.5 and 8 volts
- Wiper position is maintained in the absence of power
- Low cost alternative to mechanical controls
- Applications include volume, tone, contrast, brightness, and dimmer control
- 8-pin SOIC and 8-pin DIP packages for DS1669
- Standard resistance values for Dallastat
  - DS1668/DS1669-10 ~ 10KΩ
  - DS1668/DS1669-50 ~ 50KΩ
  - DS1668/DS1669-100 ~ 100KΩ
- Operating Temperature Range
  - Commercial: 0°C to 70°C; DS1668, DS1669
  - Industrial: -40°C to +85°C; DS1669

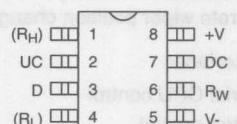
### PIN ASSIGNMENT DS1668



### PIN ASSIGNMENT DS1669



8-Pin DIP (300 Mil)  
See Mech. Drawings  
Section



8-Pin SOIC (208 Mil)  
See Mech. Drawings  
Section

### PIN DESCRIPTION DS1669

R <sub>H</sub>	- Resistor High End
R <sub>W</sub>	- Resistor Wiper
R <sub>L</sub>	- Resistor Low End
-V, +V	- Voltage Inputs
UC	- Up Contact Input
D	- Digital Input
DC	- Down Contact Input

### PIN DESCRIPTION DS1668

+V	- Positive Voltage Input
-V	- Negative Voltage
R <sub>W</sub>	- Resistor Wiper
D	- Digital Input
R <sub>H</sub>	- Resistor High End
NC	- No Connection - Pin Missing

**DALLAS**  
SEMICONDUCTOR

## DS1800 Dual Inverting Log Gain/Attenuator

### FEATURES

- Ultra-low power consumption
- Operates from 3V or 5V supplies
- Two digitally controlled, 128-position potentiometers including mute
- Logarithmic Gain Characteristics
- Zero-crossing detection circuitry eliminates noise caused by discrete wiper position changes
- Two Control Interfaces
  - 3-wire serial CPU control
  - Push-button control
- 20-pin DIP (300 Mil), 20-pin SOIC (300 Mil), and 20-pin (173 Mil) TSSOP packaging available
- Operating Temperature:
  - Commercial: 0°C to 70°C
  - Industrial: -40°C to +85°C
- Software and hardware mute
- Resistance Available: 53KΩ

### DESCRIPTION

The DS1800 is a dual audio-taper potentiometer designed specifically for use in the feedback path of the inverting configuration of an operational amplifier (see Figure 2). In this configuration, the DS1800 provides a  $V_o/V_i$  relationship of  $-20\log(R_f/R_i)$  giving a gain/attenuation range covering +20 dB to -63 dB. Each potentiometer has a total of 129 positions including mute. The

### PIN ASSIGNMENT

GND	1	20	V <sub>CC</sub>
C <sub>OUT</sub>	2	19	P1G
CLK	3	18	P1A
D	4	17	P0G
RST	5	16	P0A
ZCEN	6	15	MUTE
MODE	7	14	AGND
W0	8	13	IN1
OUT0	9	12	OUT1
INO	10	11	W1

20-PIN DIP (300 MIL)  
20-PIN SOIC (300 MIL)  
20-PIN TSSOP

See Mech. Drawings  
Section

### PIN DESCRIPTION

OUT0,OUT1	– Low-end of resistor
INO, IN1	– High-end of resistor
W0,W1	– Wiper Terminal
V <sub>CC</sub>	– 3V or 5V Power Supply Input
RST	– Serial Port Reset Input
CLK	– Serial Port Clock Input
D	– Serial Port Data Input
C <sub>OUT</sub>	– Cascade Data Output
P0G,P1G	– Gain Input Pot Controls
P0A,P1A	– Attenuation Input Pot Controls
ZCEN	– Zero-Crossing Detect Input
MUTE	– Hardware Mute Control Input
AGND	– Analog Ground
GND	– Ground

DS1800 provides five areas of resolution which include 0.25 dB per step from +20 dB to +3 dB, 0.5 dB per step from +3 dB to -12 dB, 1 dB from -12 dB to -27 dB, and from -27 dB to -47 dB; 2 dB per step, and from -47 dB to -63 dB; 4 dB per step. The mute position provides 100 dB of attenuation.

**DALLAS**  
SEMICONDUCTOR

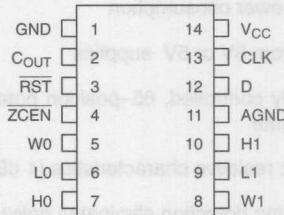
# DS1801

## Dual Audio Taper Potentiometer

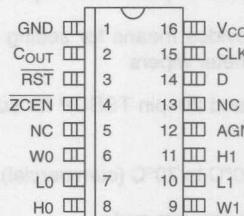
### FEATURES

- Ultra-low power consumption
- Operates from 3V or 5V supplies
- Two digitally controlled, 65-position potentiometers including mute
- Logarithmic resistive characteristics (1 dB per step)
- Zero-crossing detection eliminates noise caused by wiper movement
- Serial port provides means for setting and reading both potentiometer wipers
- 14-pin PDIP, 16-pin SOIC, and 14-pin TSSOP packages
- Temperature: -40°C to +85°C (industrial)
- Software mute
- Resistance available: 45KΩ

### PIN ASSIGNMENT



DS1801 14-PIN PDIP (300 MIL)  
DS1801E 14-PIN TSSOP (173 MIL)



DS1801S 16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

L0, L1	— Low End of Resistor
H0, H1	— High End of Resistor
W1, W2	— Wiper End of Resistor
V <sub>CC</sub>	— 3V/5V Power Supply Input
RST	— Serial Port Reset Input
D	— Serial Port Data Input
CLK	— Serial Port Clock Input
GND	— Digital Ground
AGND	— Analog Ground
ZCEN	— Zero-Crossing Detect
C <sub>OUT</sub>	— Cascade Output
NC	— No Connect

### DESCRIPTION

The DS1801 is a dual audio taper potentiometer having logarithmic resistive characteristics over the device range. Each potentiometer provides 65 wiper positions with a 1 dB increment per step and device mute. The 3-wire serial interface, using a CPU, provides the user

the ability of reading or writing exact wiper positions of the two potentiometers. Additionally, the part contains a zero-crossing detection feature that minimizes noise resulting from wiper transitions. Packages for the part include a 14-pin PDIP, 16-pin SOIC, and 14-pin TSSOP.

**DALLAS**  
SEMICONDUCTOR

## DS1802

### Dual Audio Taper Potentiometer with Push-button Control

#### FEATURES

- Ultra-low power consumption
- Operates from 3V or 5V supplies
- Two digitally controlled, 65-position potentiometers including mute
- Logarithmic resistive characteristics (1 dB per step)
- Zero-crossing detection eliminates noise caused by wiper movement
- Digital or mechanical pushbutton wiper control
- Serial port provides means for setting and reading both potentiometer wipers
- 20-pin SOIC and 20-pin TSSOP for surface mount applications
- Temperature: 0°C to 70°C (commercial)
- Software and hardware mute

#### DESCRIPTION

The DS1802 is a dual audio taper potentiometer having logarithmic resistive characteristics over the device range. Each potentiometer provides 65 wiper positions with a 1 dB increment per step and device mute. The DS1802 has two methods of device control which include contact closure (push-button) inputs and a 3-wire serial interface for wiper positioning. The push-button control inputs provide a simple interface for device control without the need for a CPU. The 3-wire serial interface, using a CPU, provides the user the ability of

#### PIN ASSIGNMENT

GND	1	20	V <sub>CC</sub>
C <sub>OUT</sub>	2	19	VU (UC1)
CLK	3	18	VD (DC1)
D	4	17	B0 (UC0)
RST	5	16	B1 (DC0)
ZCEN	6	15	MUTE
MODE	7	14	AGND
W0	8	13	H1
L0	9	12	L1
H0	10	11	W1

20-PIN DIP (300 MIL)  
20-PIN SOIC (300 MIL)  
20-PIN TSSOP (173 MIL)  
See Mech. Drawings  
Section

#### PIN DESCRIPTION

L0, L1	— Low End of Resistor
H0, H1	— High End or Resistor
W1, W2	— Wiper End of Resistor
V <sub>CC</sub>	— 3V/5V Power Supply Input
RST	— Serial Port Reset Input
D	— Serial Port Data Input
CLK	— Serial Port Clock Input
MODE	— Mode Select Input
UC0, UC1	— Up Control push-button Inputs
DC0, DC1	— Down Control push-button Inputs
VU, VD	— Volume-Up/Volume-Down Inputs
B0, B1	— Balance Pot-0, Pot-1 Inputs
GND	— Digital Ground
MUTE	— Mute
AGND	— Analog Ground
ZCEN	— Zero-Crossing Detect
C <sub>OUT</sub>	— Cascade Output

reading or writing exact wiper positions of the two potentiometers. The DS1802 can also be configured to operate in either independent or "stereo" modes, when using push-button control. Independent mode of operation allows for independent wiper control and stereo mode of operation provides single input control over both potentiometer wiper positions. The DS1802 is offered in commercial temperature versions. Packages for the part include a 20-pin DIP, 20-pin SOIC, and 20-pin TSSOP.

**DALLAS**  
SEMICONDUCTOR

**DS1803**

Addressable Dual Digital Potentiometer

### FEATURES

- 3V or 5V power supplies
- Ultra-low power consumption
- Two digitally controlled, 256-position potentiometers
- 14-Pin TSSOP (173 mil) and 16-Pin SOIC (150 mil) packaging available for surface mount applications
- Addressable using 3-chip select inputs
- Serial/synchronous bus interface
- Operating temperature: -40°C to +85°C (industrial)
- Standard resistance values:

  - DS1803-010      10KΩ
  - DS1803-050      50KΩ
  - DS1803-100      100KΩ

### PIN ASSIGNMENT

H1	1	14	VCC
L1	2	13	NC
W1	3	12	H0
A2	4	11	L0
A1	5	10	W0
A0	6	9	SDA
GND	7	8	SCL

DS1803E 14-PIN TSSOP (173 MIL)

H1	1	16	VCC
NC	2	15	NC
L1	3	14	H0
W1	4	13	L0
A2	5	12	W0
A1	6	11	NC
A0	7	10	SDA
GND	8	9	SCL

DS1803Z 16-PIN SOIC (150 MIL)

DS1803 16-PIN DIP (300 MIL)

See Mech. Drawings  
Section

### PIN DESCRIPTION

L0, L1	- Low End of Resistor
H0, H1	- High End of Resistor
W0, W1	- Wiper Terminal of Resistor
V <sub>CC</sub>	- 3V/5V Power Supply Input
A0 .. A2	- Chip Select Inputs
SDA	- Serial Data I/O
SCL	- Serial Clock Input
GND	- Ground
NC	- No connection

### DESCRIPTION

The DS1803 is an addressable device having two independently controlled potentiometers. Each potentiometer's wiper can be set to one of 256 positions. Device control is achieved via a 2-wire serial interface having a data I/O terminal and a clock input terminal. Device addressing is provided through three chip select input terminals and correct communication protocol. Addressing capability, when operating in a bus topo-

gy, allows up to eight devices to be controlled by the serial interface. The exact wiper position of each potentiometer can be written or read. The DS1803 is available in a 16-pin DIP, 16-pin SOIC and 14-pin TSSOP package. The device is available in three standard resistance values: 10KΩ, 50KΩ, and 100KΩ, and is specified over the industrial temperature range.

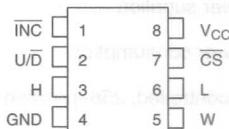
**DALLAS**  
SEMICONDUCTOR

**DS1804**  
NV Trimmer Potentiometer

## FEATURES

- Single 100-position linear taper potentiometer
- Nonvolatile "on-demand" wiper storage
- Operates from 3V or 5V supplies
- Up/Down, increment controlled interface
- Resistance Values: 10K $\Omega$ , 50K $\Omega$ , and 100K $\Omega$
- Available in 8-pin (300-mil) DIP, 8-pin (150-mil) SOIC packages
- Operating Temperature: -40°C to 85°C (industrial)

## PIN ASSIGNMENT



8-PIN DIP (300 MIL)  
8-PIN SOIC (150 MIL)

See Mech. Drawings  
Section

## PIN DESCRIPTION

H	- High-End of Resistor
L	- Low-End of Resistor
W	- Wiper Terminal
V <sub>CC</sub>	- 3V or 5V Power Supply Input
CS	- Chip Select
U/D	- Up/Down Control Input
INC	- Increment/Decrement Counter Input
GND	- Ground

## DESCRIPTION

The DS1804 is a nonvolatile digital potentiometer having 100 positions. The device provides an ideal method for low-cost trimming applications using a CPU or manual control input with minimal external circuitry. Wiper position of the DS1804 can be stored in EEPROM memory on demand. The device's wiper position is manipulated by a 3-terminal port that provides an increment/decrement counter controlled interface. This port consists of the control inputs CS, INC, and U/D.

The DS1804 is available in three resistor grades which include a 10K $\Omega$ , 50K $\Omega$ , and 100K $\Omega$ . The device is provided in an industrial temperature grade. Additionally, the DS1804 will operate from 3V or 5V supplies and is ideal for portable application requirements. Two packaging options are available and include the 8-pin (300-mil) DIP and 8-pin (150-mil) SOIC.

**DALLAS**  
SEMICONDUCTOR

# DS1806

## Digital Sextet Potentiometer

### FEATURES

- Six digitally controlled 64-position potentiometers
- 3-wire serial port provides for reading and setting each potentiometer
- Devices can be cascaded for single processor multi-device control
- Standard resistance values
  - DS1806-010 - 10K ohm
  - DS1806-050 - 50K ohm
  - DS1806-100 - 100K ohm
- Temperature: -40°C to +85°C (industrial)

### PIN ASSIGNMENT

W1	1	20	V <sub>CC</sub>
W2	2	19	H1
L1-3	3	18	H2
W3	4	17	H3
W4	5	16	H4
L4-6	6	15	H5
W6	7	14	W5
RST	8	13	H6
CLK	9	12	D <sub>IN</sub>
GND	10	11	C <sub>OUT</sub>

DS1806 20-PIN DIP (300 MIL)

DS1806S 20-PIN SOIC (300 MIL)

DS1806E 20-PIN TSSOP (173 MIL)

See Mech. Drawings  
Section

### PIN DESCRIPTION

V <sub>CC</sub>	- 3V or 5V Supply
RST	- Serial Port Reset Input
D <sub>IN</sub>	- Serial Port Data Input
CLK	- Serial Port Clock Input
C <sub>OUT</sub>	- Cascade Data Output
H1 - H6	- High End Terminal of Pot
W1 - W6	- Wiper Terminal of Pot
GND	- Ground
L1-3	- Low Terminal Pots 1 thru 3
L4-6	- Low Terminal Pots 4 thru 6

### DESCRIPTION

The DS1806 is a six-channel digitally controlled solid-state linear potentiometer. Each potentiometer is comprised of 63 equiresistive sections as illustrated in the block diagram of Figure 1. Each potentiometer has three terminals accessible to the user. These include the high side terminals, H<sub>X</sub>, the wiper terminals, W<sub>X</sub>, and the low-end terminals, L1-3 and L4-6. Potentiometers 1 through 3 share the same low-end terminal L1-3. And likewise, potentiometers 4 through 6 share the low-end terminal L4-6.

Each wiper's position is selected via an 8-bit register value. Communication and control of the device is ac-

complished via a 3-wire serial port interface. This interface in conjunction with a cascade output allows the value of the device wiper settings to be read.

For multiple device and single processor environments, the DS1806 can be cascaded or daisy chained. This feature allows a single processor to control multiple devices.

The DS1806 is available in 10K, 50K and 100K ohm versions and is specified over the industrial temperature range. Packages for the device include 20-lead DIPs, SOICs, and TSSOPs.

**DALLAS**  
SEMICONDUCTOR

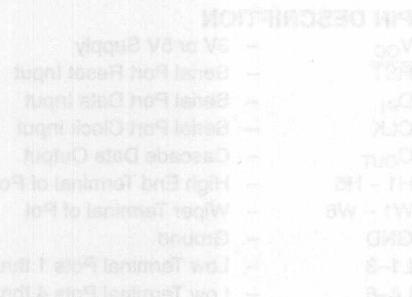
# DS1807

## Addressable Dual Audio Taper Potentiometer

### FEATURES

- Operates from 3V or 5V power supplies
- Ultra-low power consumption
- Two digitally controlled, 65-position potentiometers
- Logarithmic resistor characteristics (1 dB per step)
- Zero-crossing detection eliminates noise caused by discrete wiper changes
- Addressable using 3-chip select inputs
- Serial/synchronous bus interface
- Temperature: -40°C to +85°C (industrial)
- Resistance value: 45KΩ

### PIN DESCRIPTION



### PIN ASSIGNMENT

PIN DESCRIPTION		PIN ASSIGNMENT	
GND	1	14	V <sub>CC</sub>
A2	2	13	SCL
A1	3	12	SDA
A0	4	11	AGND
W0	5	10	H1
L0	6	9	L1
H0	7	8	W1

DS1807 14-PIN DIP (300 MIL)  
DS1807E 14-PIN TSSOP (173 MIL)

PIN DESCRIPTION		PIN ASSIGNMENT	
GND	1	16	V <sub>CC</sub>
A2	2	15	NC
A1	3	14	SCL
NC	4	13	SDA
A0	5	12	AGND
W0	6	11	H1
L0	7	10	L1
H0	8	9	W1

DS1807S 16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

L0,L1	- Low End of Resistor
H0,H1	- High End of Resistor
W0,W1	- Wiper Terminal of Resistor
V <sub>CC</sub>	- 3V/5V Power Supply Input
A0 . . . A2	- Chip Select Inputs
SDA	- Serial Data I/O
SCL	- Serial Clock Input
GND	- Digital Ground
AGND	- Analog Ground
NC	- No connection

The DS1807 is a dual audio taper potentiometer having a logarithmic resistive characteristic. Each potentiometer has a total of 65 wiper positions, including the mute position. Adjacent wiper positions are separated by 1 dB giving a total attenuation range of 64 dB. When the wipers are in the mute position, attenuation in excess of 90 dB is achieved. The DS1807 also provides a zero-crossing detection capability. This capability eliminates noise caused by discrete wiper position changes. The DS1807 is controlled via a two input, serial synchronous interface that provides the capability of addressing up to eight different DS1807s. Addressability is obtained via communication protocol and three address select inputs A0, A1, and A2.

### DESCRIPTION

The DS1807 is a dual audio taper potentiometer having a logarithmic resistive characteristic. Each potentiometer has a total of 65 wiper positions, including the mute position. Adjacent wiper positions are separated by 1 dB giving a total attenuation range of 64 dB. When the wipers are in the mute position, attenuation in excess of 90 dB is achieved. The DS1807 also provides a zero-

# DALLAS SEMICONDUCTOR

**DS1809**  
**Dallastat**

## FEATURES

- 64-position linear taper
- Two nonvolatile wiper storage options
- Operates from +2.7 to +5.5 volt supplies
- Standard Resistance values:  
10K $\Omega$ , 50K $\Omega$ , 100K $\Omega$
- Industrial Operating Temperature Range:  
-40°C to +85°C
- Electronic interface provides either digital or push-button control
- Low cost alternative to mechanical solutions

## DESCRIPTION

The DS1809 Dallastat is a nonvolatile digitally controlled potentiometer that provides 64 uniform wiper positions over the entire resistor range; including the high-end and low-end terminals of the device. The DS1809 is a low power, low voltage device capable of operating from power supplies of +2.7V to +5.5V. The device is ideal for low-power, portable, or battery powered applications.

Wiper position is maintained in the absence of power. This is accomplished via the use of an EEPROM cell array. The device provides for two storage methods which include an auto-store capability and a command-initiated storage function. The EEPROM cell array is specified to accept greater than 50K writes. Storage of the wiper position is discussed in the Wiper Storage section of this datasheet.

## PIN ASSIGNMENT

## PIN DESCRIPTION



8-PIN DIP  
8-PIN SOIC (150 MIL)  
8-PIN µSOP (118 MIL)

## PIN DESCRIPTION

V <sub>CC</sub>	- Supply Voltage
R <sub>H</sub>	- High End of Resistor
R <sub>L</sub>	- Low End of Resistor
R <sub>W</sub>	- Wiper Terminal
UC	- Up Control Input
DC	- Down Control Input
STR	- Storage Enable Input
GND	- Ground

Wiper positioning is controlled via a patented dual push-button (or contact closure) interface. For simple push-button controlled applications or CPU generated control signals, external debounce circuitry is not needed. The control interface will support both repetitive pulse inputs and continuous pulse ("push-and-hold") inputs. Repetitive pulse and continuous pulse control, as well as, timing diagrams are discussed in the section entitled "OPERATION".

The DS1809 is available in standard 10K $\Omega$ , 50K $\Omega$ , and 100K $\Omega$  resistor versions. The DS1809 is provided as an industrial temperature grade part only. Available packaging for the DS1809 include an 8-lead (300 mil) DIP an 8-lead (150 mil) SOIC, and an 8-lead (118 mil) µSOP.

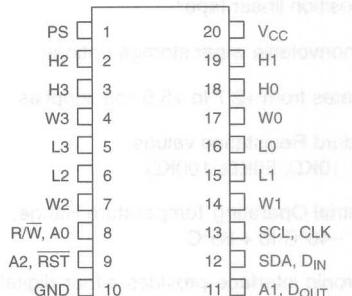


**DS1844**  
Quad Digital Potentiometer

## FEATURES

- Four independent, digitally controlled, 64-position potentiometers
  - Two interface control options
    - 5-wire serial
    - 2-wire addressable
  - Standard resistance values
    - DS1844-010 10KΩ
    - DS1844-050 50KΩ
    - DS1844-100 100KΩ
  - Mixed resistor value combinations (contact factory for availability)
  - Operating temperature: -40°C to +85°C

## PIN ASSIGNMENT



20-PIN DIP (300 MIL.)

20-PIN DIP (300 MIL)  
20-PIN SOIC (300 MIL)

20-PIN TSSOP (173 MIL)

## PIN DESCRIPTION

- 2.7V to 5.5V
  - Port Select
  - Device Select Pins (2-Wire)
  - Serial Data I/O (2-Wire)
  - Serial Clock (2-Wire)
  - Read/Write Enable (5-Wire)
  - Serial Port Reset Input (5-Wire)
  - Serial Port Data Input (5-Wire)
  - Serial Port Clock Input(5-Wire)
  - Cascade Data Output (5-Wire)
  - High-end terminal of pot
  - Low-end terminal of pot
  - Wiper terminal of pot
  - Ground

**DESCRIPTION**  
The DS1844 is a four-channel, digitally controlled linear potentiometer. Each potentiometer is comprised of 63 equi-resistive sections and has three terminals accessible to the user. These include the high-side terminals,  $H_X$ , the wiper terminals,  $W_X$ , and the low-side terminals,  $L_X$ .

**DALLAS**  
SEMICONDUCTOR

## DS1866 Log Trimmer Potentiometer

### FEATURES

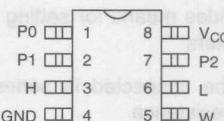
- Single 8-position Log Trimmer Potentiometer 5-dB/step
- Operates from 2.7V to 5.5V supplies
- Parallel interface control: P0, P1, P2
- Resistance value: 10KΩ
- 8-pin DIPs; 8-pin (150) SOICs
- Operating temperature:
  - Industrial: -40°C to +85°C



### PIN ASSIGNMENT



8-PIN DIP (300 MIL)  
See Mech. Drawings  
Section



8-PIN SOIC (150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

H	– High End of Resistor
L	– Low End of Resistor
W	– Wiper Terminal
V <sub>CC</sub>	– 3V or 5V Power Supply Input
P0	– Position Select – Bit 0
P1	– Position Select – Bit 1
P2	– Position Select – Bit 2
GND	– Ground

### DESCRIPTION

The DS1866 is a single volatile digital potentiometer having eight positions with a 5 dB resolution per step. The device provides an ideal method for low-cost trimming or volume control using a CPU or manual control input. The device's wiper position is set to one of eight positions by a 3-terminal parallel port. The value of the wiper position is determined by the P0, P1, and P2 port pins.

The DS1866 is available as a 10K potentiometer and is available in an industrial temperature grade. Additionally, the DS1866 will operate from 3V or 5V supplies and is ideal for portable applications requiring low standby

current. Two packaging options are available and include the 8-pin (300 mil) DIP, 8-pin (150 mil) SOIC.

### OPERATION

The DS1866 is a single volatile potentiometer. The device has a total of eight positions providing a resolution of 5 dB per step and giving a total attenuation range of 0 dB to -35 dB. These tap points are accessible to the W-terminal whose position is controlled via a 3-terminal parallel port consisting of input signals P0, P1, and P2. A block diagram of the DS1866 is shown in Figure 1.

**DALLAS**  
SEMICONDUCTOR

**DS1867**  
Dual Digital Potentiometer with EEPROM

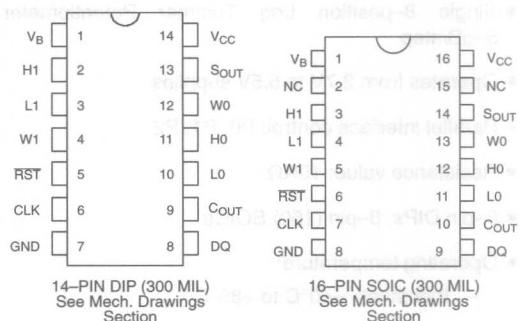
## FEATURES

- Nonvolatile version of the popular DS1267
- Low power consumption, quiet, pimpleless design
- Operates from single 5V or  $\pm 5V$  supplies
- Two digitally controlled, 256-position potentiometers
- Wiper position is maintained in the absence of power
- Serial port provides means for setting and reading both potentiometers
- Resistors can be connected in series to provide increased total resistance
- 16-pin SOIC and 20-pin TSSOP for surface mount applications
- Standard resistance values:
  - DS1867-10 ~ 10K $\Omega$
  - DS1867-50 ~ 50K $\Omega$
  - DS1867-100 ~ 100K $\Omega$
- Temperature:
  - Commercial: 0°C to 70°C
  - Industrial: –40°C to +85°C

## DESCRIPTION

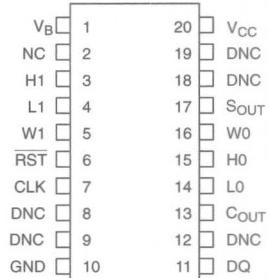
The DS1867 is the nonvolatile version of the popular DS1267 Dual Digital Potentiometer. The DS1867 consists of two digitally controlled potentiometers having 256-position wiper settings. Wiper position is maintained in the absence of power through the use of EEPROM memory cell arrays. Communication and control of the device are accomplished over a 3-wire serial port which allows reads and writes of the wiper position. Both potentiometers can be stacked for increased total resistance with the same resolution. For multiple-device, single processor environments, the DS1867 can be cascaded for control over a single 3-wire bus. The DS1867 is offered in three standard resistance values and commercial and industrial temperature versions.

## PIN ASSIGNMENT



14-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section



20-PIN TSSOP (173 MIL)  
See Mech. Drawings  
Section

## PIN DESCRIPTION

L0, L1	– Low End of Resistor
H0, H1	– High End of Resistor
W1, W2	– Wiper End of Resistor
V <sub>B</sub>	– Substrate Bias
S <sub>OUT</sub>	– Wiper for Stacked Configuration
RST	– Serial Port Reset Input
DQ	– Serial Port Data Input
CLK	– Serial Port Clock Input
C <sub>OUT</sub>	– Cascade Serial Port Output
V <sub>CC</sub>	– +5 Volt Supply Input
GND	– Ground
NC	– No Internal Connection
DNC	– Do Not Connect

**DALLAS**  
SEMICONDUCTOR

# DS1868

## Dual Digital Potentiometer Chip

### FEATURES

- Ultra-low power consumption, quiet, pumpless design
- Two digitally controlled, 256-position potentiometers
- Serial port provides means for setting and reading both potentiometers
- Resistors can be connected in series to provide increased total resistance
- 20-pin TSSOP package
- Resistive elements are temperature compensated to  $\pm 0.3$  LSB relative linearity
- Standard resistance values:
  - DS1868-10  $\sim 10\text{k}\Omega$
  - DS1868-50  $\sim 50\text{k}\Omega$
  - DS1868-100  $\sim 100\text{k}\Omega$
- $+5\text{V}$  or  $\pm 3\text{V}$  operation
- Temperature:  $0^\circ\text{C}$  to  $70^\circ\text{C}$  commercial  
 $-40^\circ\text{C}$  to  $85^\circ\text{C}$  industrial

### PIN ASSIGNMENT

V <sub>B</sub>	1	20	V <sub>CC</sub>
DNC	2	19	DNC
H1	3	18	DNC
L1	4	17	S <sub>OUT</sub>
W1	5	16	W0
RST	6	15	H0
CLK	7	14	L0
DNC	8	13	C <sub>OUT</sub>
DNC	9	12	DNC
GND	10	11	DQ

20-PIN TSSOP (173 MIL)

V <sub>B</sub>	1	14	V <sub>CC</sub>
NC	2	13	S <sub>OUT</sub>
H1	3	12	W0
L1	4	11	H0
W1	5	10	L0
RST	6	9	C <sub>OUT</sub>
CLK	7	8	DQ
GND	8	7	

DS1868S 16-PIN SOIC (300 MIL)

14-PIN DIP (300 MIL)

### PIN DESCRIPTION

L0, L1	- Low End of Resistor
H0, H1	- High End of Resistor
W0, W1	- Wiper Terminal of Resistor
S <sub>OUT</sub>	- Stacked Configuration Output
RST	- Serial Port Reset Input
DQ	- Serial Port Data Input
CLK	- Serial Port Clock Input
C <sub>OUT</sub>	- Cascade Port Output
V <sub>CC</sub>	- +5 Volt Supply
GND	- Ground Connections
NC	- No Internal Connection
V <sub>B</sub>	- Substrate Bias Voltage
DNC	- Do Not Connect

\*All GND pins must be connected to ground.

### DESCRIPTION

The DS1868 consist of two digitally controlled solid-state potentiometers. Each potentiometer is composed of 256 resistive sections. Between each resistive sec-

tion and both ends of the potentiometer are tap points which are accessible to the wiper.



# DS1869 3V Dallastat™ Electronic Digital Rheostat

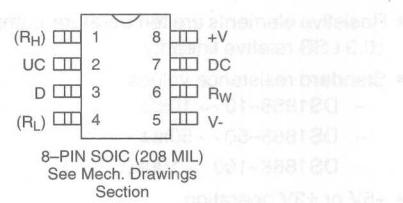
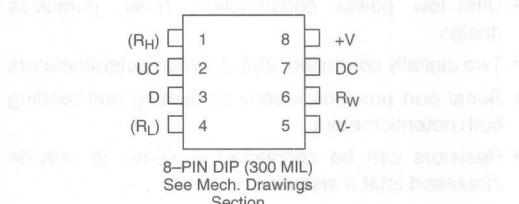
## FEATURES

- Replaces mechanical variable resistors
- Operates from 3V or 5V supplies
- Electronic interface provided for digital as well as manual control
- Wiper position is maintained in the absence of power
- Low cost alternative to mechanical controls
- Applications include volume, tone, contrast, brightness, and dimmer control
- 8-pin SOIC and 8-pin DIP packages for DS1869
- Standard resistance values for Dallastat
  - DS1869-10 ~ 10KΩ
  - DS1869-50 ~ 50KΩ
  - DS1869-100 ~ 100KΩ
- Operating Temperature Range: 20°C to 70°C
- 3V to 8V differential supply operational range

## DESCRIPTION

The DS1869 Dallastat™ is a digital rheostat or potentiometer. This device provides 64 possible uniform tap points over the resistive range and is available in standard versions of 10KΩ, 50KΩ, and 100KΩ. The Dallastats can be controlled by either a mechanical-type contact closure input or a digital source input such as a CPU. The DS1869 operates from 3V or 5V supplies. Wiper position is maintained in the absence of power which is accomplished through the use of an EEPROM memory cell array. The EEPROM cell array is specified to accept greater than 50,000 writes.

## PIN ASSIGNMENT



## PIN DESCRIPTION

R <sub>H</sub>	- Resistor High End (Option)
R <sub>W</sub>	- Resistor Wiper
R <sub>L</sub>	- Resistor Low End
-V, +V	- Voltage Inputs
UC	- Up Contact Input
D	- Digital Input
DC	- Down Contact Input

The DS1869 is offered in two standard IC packages, which include an 8-pin 300 mil DIP and an 8-pin 208 mil SOIC. The DS1869 can be configured to operate using a single push-button, dual push-button or digital source input. This is illustrated in Figures 1 and 2. The DS1869 pinouts allow access to both ends of the potentiometer R<sub>L</sub>, R<sub>H</sub>, and the wiper, R<sub>W</sub>. Control inputs include the digital source input, D, the up contact input, UC, and the down contact input, DC. Other pins include the positive,+V, and negative,-V, supply inputs. The DS1869 is specified to operate from -20°C to +70°C.

## LINE INTERFACES

DS232  
RS-232 Transmitter/Receiver

Semiconductors

PIN ASSIGNMENT		FEATURES	
20	OC	1	OC output
19	ER	2	5V
18	TR	3	OC
17	TR	4	OC
16	ST	5	OC
15	TR	6	OC
14	BT	7	OC
13	TR	8	OC
12	BT	9	OC
11	BT	10	OC
10	BT	11	OC
9	BT	12	OC
8	BT	13	OC
7	BT	14	OC
6	BT	15	OC
5	BT	16	OC
4	BT	17	OC
3	BT	18	OC
2	BT	19	OC
1	BT	20	OC

DS-232 Pin Out Diagram

PIN DESCRIPTION	DS232	DE232	DE232E	DE232N	DE232P	DE232R	DE232S	DE232T	DE232U	DE232V	DE232W	DE232X	DE232Y	DE232Z
-Ave Gnd	Ave													
-Gnd	GND													
-Positive Supply Output	+V													
-Negative Supply Output	-V													
-RS-232 Driver Outputs	TR0, TR1, TR2, TR3													
-RS-232 Driver Inputs	RI0, RI1, RI2, RI3													
-RS-232 Driver Outputs	CI0, CI1													
-RS-232 Driver Inputs	CO0, CO1													

DE232 Pin Out Diagram

**DESCRIPTION**  
The DS232 is a single RS-232 Transmitter/Receiver module. It features a built-in driver/receiver pair for each data line. A driver/receiver pair is also included for the control lines. The module is designed to interface with standard PC serial ports.

**DESCRIPTION**  
The DS232 is a single RS-232 Transmitter/Receiver module. It features a built-in driver/receiver pair for each data line. A driver/receiver pair is also included for the control lines. The module is designed to interface with standard PC serial ports.



# DS229

## Triple RS-232 Transmitter/Receiver

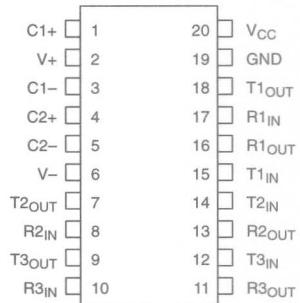
### FEATURES

- Compatible with DS1229
- 5V operation
- 20-pin DIP or SOIC package
- 20-pin TSSOP package for height restricted applications
- Operate from single +5V power
- Meets all EIA-232E and V.28 specifications
- Uses small capacitors: 0.1  $\mu$ F
- Optional industrial temperature range available (-40°C to +85°C)

### ORDERING INFORMATION

DS229	20-pin DIP
DS229N	20-pin DIP (Industrial)
DS229S	20-pin SOIC
DS229SN	20-pin SOIC (Industrial)
DS229E	20-pin TSSOP
DS229EN	20-pin TSSOP (Industrial)

### PIN ASSIGNMENT



20-PIN DIP, SOIC AND TSSOP

### PIN DESCRIPTION

V <sub>CC</sub>	- +5 Volt Supply
GND	- Ground
V+	- Positive Supply Output
V-	- Negative Supply Output
T1 <sub>IN</sub> , T2 <sub>IN</sub> , T3 <sub>IN</sub>	- RS-232 Driver Inputs
T1 <sub>OUT</sub> , T2 <sub>OUT</sub> , T3 <sub>OUT</sub>	- RS-232 Driver Outputs
R1 <sub>IN</sub> , R2 <sub>IN</sub> , R3 <sub>IN</sub>	- Receiver Inputs
R1 <sub>OUT</sub> , R2 <sub>OUT</sub> , R3 <sub>OUT</sub>	- Receiver Outputs
C1+, C1-	- Capacitor 1 Connections
C2+, C2-	- Capacitor 2 Connections

### DESCRIPTION

The DS229 is a triple RS-232 driver/receiver pair that generates RS-232 voltage levels from a single +5 volt power supply. Additional  $\pm 12$  volt supplies are not needed since the DS229 uses on-board charge pumps to convert the +5 volt supply to  $\pm 10$  volts. The DS229 is fully compliant with EIA RS-232E and V.28/V.24 standards. The DS229 contains three drivers and three receivers. Driver slew rates and data rates are guaranteed up to 116 kbits/sec. The DS229 operates with only 0.1  $\mu$ F charge pump capacitors.

### OPERATION

The diagram in Figure 1 shows the main elements of the DS229. The following paragraphs describe the function of each pin.

**DALLAS**  
SEMICONDUCTOR

# DS232A

## Dual RS-232 Transmitter/Receiver

### FEATURES

- Compatible with LT1181A and MAX232A
- High data rate – 250K bits/sec under load
- 16-pin DIP or SOIC package
- 20-pin TSSOP package for height restricted applications
- Operate from single +5V power
- Meets all EIA-232E and V0.28 specifications
- Uses small capacitors: 0.1  $\mu$ F
- Optional industrial temperature range available  
(-40°C to +85°C)

### ORDERING INFORMATION

DS232A	16-pin DIP
DS232A-N	16-pin DIP (Industrial)
DS232AR	16-pin SOIC (150 Mil)
DS232AR-N	16-pin SOIC (150 Mil) (Industrial)
DS232AS	16-pin SOIC (300 Mil)
DS232AS-N	16-pin SOIC (300 Mil) (Industrial)
DS232AE	20-pin TSSOP
DS232AE-N	20-pin TSSOP (Industrial)

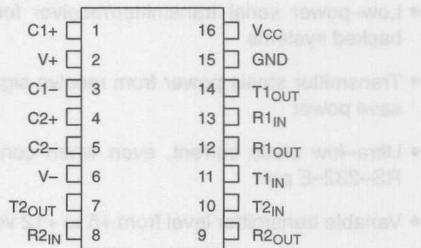
### DESCRIPTION

The DS232A is a dual RS-232 driver/receiver pair that generates RS-232 voltage levels from a single +5 volt power supply. Additional  $\pm 12$  volt supplies are not needed since the DS232A uses on-board charge pumps to convert the +5 volt supply to  $\pm 10$  volts. The DS232A is fully compliant with EIA RS-232E and V0.28/V0.24 standards. The DS232A contains two drivers and two receivers. Driver slew rates and data rates are guaranteed up to 250K bits/sec. The DS232A operates with only 0.1  $\mu$ F charge pump capacitors.

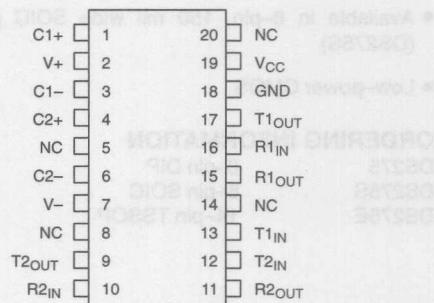
### OPERATION

The diagram in Figure 1 shows the main elements of the DS232A. The following paragraphs describe the function of each pin.

### PIN ASSIGNMENT



16-PIN DIP AND SOIC



20-PIN TSSOP

### PIN DESCRIPTION

V <sub>CC</sub>	+5 Volt Supply
GND	Ground
V <sub>+</sub>	Positive Supply Output
V <sub>-</sub>	Negative Supply Output
T <sub>1IN</sub> , T <sub>2IN</sub>	RS-232 Driver Inputs
T <sub>1OUT</sub> , T <sub>2OUT</sub>	RS-232 Driver Outputs
R <sub>1IN</sub> , R <sub>2IN</sub>	Receiver Inputs
R <sub>1OUT</sub> , R <sub>2OUT</sub>	Receiver Outputs
C <sub>1+</sub> , C <sub>1-</sub>	Capacitor 1 Connections
C <sub>2+</sub> , C <sub>2-</sub>	Capacitor 2 Connections



# DS275

## Line-Powered RS-232 Transceiver Chip

### FEATURES

- Low-power serial transmitter/receiver for battery-backed systems
- Transmitter steals power from receive signal line to save power
- Ultra-low static current, even when connected to RS-232-E port
- Variable transmitter level from +5 to +12 volts
- Compatible with RS-232-E signals
- Available in 8-pin, 150 mil wide SOIC package (DS275S)
- Low-power CMOS

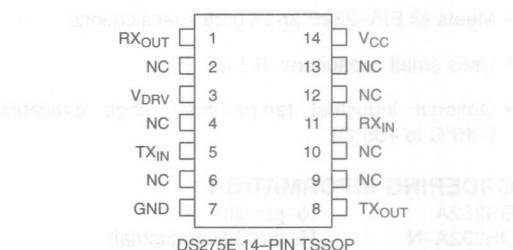
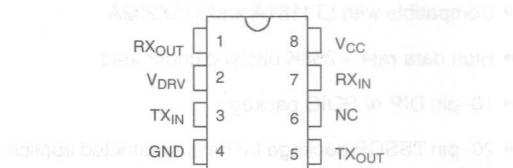
### ORDERING INFORMATION

DS275	8-pin DIP
DS275S	8-pin SOIC
DS275E	14-pin TSSOP

### DESCRIPTION

The DS275 Line-Powered RS-232 Transceiver Chip is a CMOS device that provides a low-cost, very low-power interface to RS-232 serial ports. The receiver input translates RS-232 signal levels to common CMOS/TTL levels. The transmitter employs a unique circuit which steals current from the receive RS-232 signal when that signal is in a negative state (marking). Since most serial communication ports remain in a negative state statically, using the receive signal for negative

### PIN ASSIGNMENT



### PIN DESCRIPTION

RX <sub>OUT</sub>	- RS-232 Receiver Output
V <sub>DRV</sub>	- Transmit driver +V
TX <sub>IN</sub>	- RS-232 Driver Input
GND	- System Ground (0V)
TX <sub>OUT</sub>	- RS-232 Driver Output
NC	- No Connection
RX <sub>IN</sub>	- RS-232 Receive Input
V <sub>CC</sub>	- System Logic Supply (+5V)

power greatly reduces the DS275's static power consumption. This feature is especially important for battery-powered systems such as laptop computers, remote sensors, and portable medical instruments. During an actual communication session, the DS275's transmitter will use system power (5–12 volts) for positive transitions while still employing the receive signal for negative transitions.

**DALLAS**  
SEMICONDUCTOR

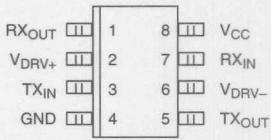
## DS276

### Low Power Transceiver Chip

#### FEATURES

- Low-power serial transmitter/receiver for battery-backed systems
- Transmitter steals power from receive signal line to save power
- Single 3V or 5V operation
- Full duplex operation up to 20K bps
- Ultra-low static current
- Compatible with RS-232-E signals

#### PIN ASSIGNMENT



DS276 8-PIN DIP (300 MIL)  
DS276S 8-PIN SOIC (150 MIL)

#### PIN DESCRIPTION

RX <sub>OUT</sub>	RS-232 Receiver Output
V <sub>DRV+</sub>	Transmit Driver Positive Supply
TX <sub>IN</sub>	RS-232 Driver Input
GND	System Ground (0V)
TX <sub>OUT</sub>	RS-232 Driver Output
V <sub>DRV-</sub>	Transmit Driver Negative Supply
RX <sub>IN</sub>	RS-232 Receiver Input
V <sub>CC</sub>	System Logic Supply (3-5V)

#### ORDERING INFORMATION

DS276	8-Pin DIP
DS276S	8-Pin SOIC

#### DESCRIPTION

The DS276 Line-Powered RS-232 Transceiver Chip is a CMOS device that provides a low-cost, very low-power interface to RS-232 serial ports. The receiver input translates RS-232 signal levels to common CMOS/TTL levels. The transmitter can be used with independently supplied positive and negative supplies, but in most cases will be used with the positive supply sharing the logic supply and the negative supply stolen from the receive RS-232 signal when that signal is in a negative state (marking). By using an external reservoir capacitor and Schottky diode (see Figure 4) this nega-

tive supply can be maintained even during full-duplex operation. Since most serial communication ports remain in a negative state statically, using the receive signal for negative power greatly reduces the DS276's static power consumption. This feature is especially important for battery-powered systems such as laptop computers, remote sensors, and portable medical instruments. During an actual communication session, the DS276's transmitter will use system power (3-12 volts) for positive transitions while still employing the receive signal for negative transitions.



# MEMORY PRODUCTS



## DS1220AB/AD 16K Nonvolatile SRAM

### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Directly replaces 2K x 8 volatile static RAM or EEPROM
- Unlimited write cycles
- Low-power CMOS
- JEDEC standard 24-pin DIP package
- Read and write access times as fast as 100 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$  V<sub>CC</sub> operating range (DS1220AD)
- Optional  $\pm 5\%$  V<sub>CC</sub> operating range (DS1220AB)
- Optional industrial temperature range of -40°C to +85°C, designated IND

### PIN ASSIGNMENT

A7	1	24	V <sub>CC</sub>
A6	2	23	A8
A5	3	22	A9
A4	4	21	WE
A3	5	20	OE
A2	6	19	A10
A1	7	18	CE
A0	8	17	DQ7
DQ0	9	16	DQ6
DQ1	10	15	DQ5
DQ2	11	14	DQ4
GND	12	13	DQ3

24-PIN ENCAPSULATED PACKAGE  
720 MIL EXTENDED

### PIN DESCRIPTION

A0–A10	– Address Inputs
DQ0–DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
V <sub>CC</sub>	– Power (+5V)
GND	– Ground

### DESCRIPTION

The DS1220AB and DS1220AD are 16,384-bit, fully static, nonvolatile SRAMs organized as 2048 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. The NV

SRAMs can be used in place of existing 2K x 8 SRAMs directly conforming to the popular bytewide 24-pin DIP standard. The devices also match the pinout of the 2716 EPROM and the 2816 EEPROM, allowing direct substitution while enhancing performance. There is no limit on the number of write cycles that can be executed and no additional support circuitry is required for microprocessor interfacing.

**DALLAS**  
SEMICONDUCTOR

# DS1220Y

## 16K Nonvolatile SRAM

### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Directly replaces 2K x 8 volatile static RAM or EEPROM
- Unlimited write cycles
- Low-power CMOS
- JEDEC standard 24-pin DIP package
- Read and write access times as fast as 100 ns
- Full  $\pm 10\%$  operating range
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND

### PIN ASSIGNMENT

A7	1	24	V <sub>CC</sub>
A6	2	23	A8
A5	3	22	A9
A4	4	21	WE
A3	5	20	OE
A2	6	19	A10
A1	7	18	CE
A0	8	17	DQ7
DQ0	9	16	DQ6
DQ1	10	15	DQ5
DQ2	11	14	DQ4
GND	12	13	DQ3

24-PIN ENCAPSULATED PACKAGE  
720 MIL EXTENDED

### PIN DESCRIPTION

A0-A10	— Address Inputs
DQ0-DQ7	— Data In/Data Out
CE	— Chip Enable
WE	— Write Enable
OE	— Output Enable
V <sub>CC</sub>	— Power (+5V)
GND	— Ground

### DESCRIPTION

The DS1220Y 16K Nonvolatile SRAM is a 16,384-bit, fully static, nonvolatile RAM organized as 2048 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. The NV

SRAM can be used in place of existing 2K x 8 SRAMs directly conforming to the popular byte-wide 24-pin DIP standard. The DS1220Y also matches the pinout of the 2716 EPROM or the 2816 EEPROM, allowing direct substitution while enhancing performance. There is no limit on the number of write cycles that can be executed and no additional support circuitry is required for microprocessor interfacing.

**DALLAS**  
SEMICONDUCTOR

## DS1225AB/AD

### 64K Nonvolatile SRAM

#### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Directly replaces 8K x 8 volatile static RAM or EEPROM
- Unlimited write cycles
- Low-power CMOS
- JEDEC standard 28-pin DIP package
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$  V<sub>CC</sub> operating range (DS1225AD)
- Optional  $\pm 5\%$  V<sub>CC</sub> operating range (DS1225AB)
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND

#### DESCRIPTION

The DS1225AB and DS1225AD are 65,536-bit, fully static, nonvolatile SRAMs organized as 8192 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. The NV

#### PIN ASSIGNMENT

NC	1	28	VCC
A12	2	27	WE
A7	3	26	NC
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
720 MIL EXTENDED

#### PIN DESCRIPTION

A0-A12	— Address Inputs
DQ0-DQ7	— Data In/Data Out
CE	— Chip Enable
WE	— Write Enable
OE	— Output Enable
V <sub>CC</sub>	— Power (+5V)
GND	— Ground
NC	— No Connect

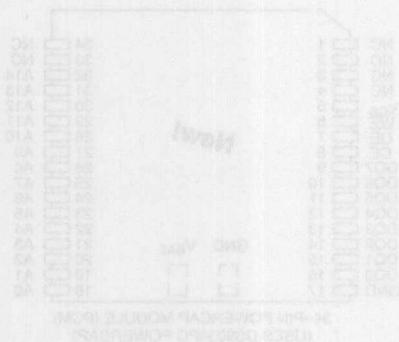
SRAMs can be used in place of existing 8K x 8 SRAMs directly conforming to the popular bytewide 28-pin DIP standard. The devices also match the pinout of the 2764 EPROM and the 2864 EEPROM, allowing direct substitution while enhancing performance. There is no limit on the number of write cycles that can be executed and no additional support circuitry is required for microprocessor interfacing.

**DALLAS**  
SEMICONDUCTOR

**DS1225Y**  
64K Nonvolatile SRAM

### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Directly replaces 8K x 8 volatile static RAM or EEPROM
- Unlimited write cycles
- Low-power CMOS
- JEDEC standard 28-pin DIP package
- Read and write access times as fast as 150 ns
- Full  $\pm 10\%$  operating range
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND



### DESCRIPTION

The DS1225Y 64K Nonvolatile SRAM is a 65,536-bit, fully static, nonvolatile RAM organized as 8192 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. The NV

### PIN ASSIGNMENT

NC	1	28	VCC
A12	2	27	WE
A7	3	26	NC
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
720 MIL EXTENDED

### PIN DESCRIPTION

A0-A12	— Address Inputs
DQ0-DQ7	— Data In/Data Out
CE	— Chip Enable
WE	— Write Enable
OE	— Output Enable
V <sub>CC</sub>	— Power (+5V)
GND	— Ground
NC	— No Connect

SRAM can be used in place of existing 8K x 8 SRAMs directly conforming to the popular bytewide 28-pin DIP standard. The DS1225Y also matches the pinout of the 2764 EPROM or the 2864 EEPROM, allowing direct substitution while enhancing performance. There is no limit on the number of write cycles that can be executed and no additional support circuitry is required for microprocessor interfacing.

**DALLAS**  
SEMICONDUCTOR

**DS1230Y/AB**  
256K Nonvolatile SRAM

### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Replaces 32K x 8 volatile static RAM, EEPROM or Flash memory
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1230Y)
- Optional  $\pm 5\%$   $V_{CC}$  operating range (DS1230AB)
- Optional industrial temperature range of  $-40^\circ C$  to  $+85^\circ C$ , designated IND
- JEDEC standard 28-pin DIP package
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

### PIN ASSIGNMENT

A14	1	28	V <sub>CC</sub> (max 0.1% V <sub>CC</sub> )
A12	2	27	WE (Write Enabled)
A7	3	26	A13 (Address Inputs)
A6	4	25	A8
A5	5	24	A9 (Address Inputs)
A4	6	23	A11 (MOSR)
A3	7	22	OE (Output Enable)
A2	8	21	A10
A1	9	20	CE (Chip Enable)
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0 – A14	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
V <sub>CC</sub>	– Power (+5V)
GND	– Ground
NC	– No Connect

**DALLAS**  
SEMICONDUCTOR

**DS1230W**  
3.3V 256K Nonvolatile SRAM

## FEATURES

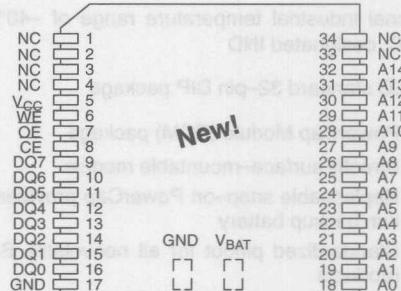
- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Replaces 32K x 8 volatile static RAM, EEPROM or Flash memory
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 150 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Optional industrial temperature range of -40°C to +85°C, designated IND
- JEDEC standard 28-pin DIP package

- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

## PIN ASSIGNMENT

A14	1	28	V <sub>CC</sub>
A12	2	27	WE
A7	3	26	A13
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

## PIN DESCRIPTION

A0 – A14	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
V <sub>CC</sub>	– Power (+3.3V)
GND	– Ground
NC	– No Connect

**DALLAS**  
SEMICONDUCTOR

**DS1245Y/AB**  
1024K Nonvolatile SRAM

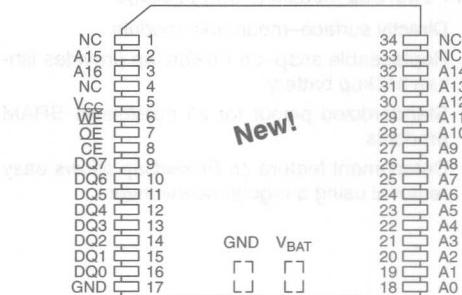
## FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Replaces 128K x 8 volatile static RAM, EEPROM or Flash memory
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1245Y)
- Optional  $\pm 5\%$   $V_{CC}$  operating range (DS1245AB)
- Optional industrial temperature range of  $-40^\circ C$  to  $+85^\circ C$ , designated IND
- JEDEC standard 32-pin DIP package
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

## PIN ASSIGNMENT

NC	1	32	$V_{CC}$
A16	2	31	A15
A14	3	30	NC
A12	4	29	$\overline{WE}$
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	$\overline{OE}$
A2	10	23	A10
A1	11	22	$\overline{CE}$
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

32-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

## PIN DESCRIPTION

A0 – A16	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
$\overline{CE}$	– Chip Enable
$\overline{WE}$	– Write Enable
$\overline{OE}$	– Output Enable
$V_{CC}$	– Power (+5V)
GND	– Ground
NC	– No Connect

**DALLAS**  
SEMICONDUCTOR

**DS1245W**  
3.3V 1024K Nonvolatile SRAM

## FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Replaces 128K x 8 volatile static RAM, EEPROM or Flash memory
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 150 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Optional industrial temperature range of -40°C to +85°C, designated IND
- JEDEC standard 32-pin DIP package
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

## PIN ASSIGNMENT

NC	1	32	V <sub>CC</sub>
A16	2	31	A15
A14	3	30	NC
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	OE
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

32-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

## PIN DESCRIPTION

A0 – A16	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
V <sub>CC</sub>	– Power (+3.3V)
GND	– Ground
NC	– No Connect

**DALLAS**  
SEMICONDUCTOR

**DS1249Y/AB**  
2048K Nonvolatile SRAM

### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Unlimited write cycles
- Low-power CMOS operation
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$  V<sub>CC</sub> operating range (DS1249Y)
- Optional  $\pm 5\%$  V<sub>CC</sub> operating range (DS1249AB)
- Optional industrial temperature range of -40°C to +85°C, designated IND
- JEDEC standard 32-pin DIP package

### PIN ASSIGNMENT

NC	1	32	V <sub>CC</sub>
A16	2	31	A15
A14	3	30	A17
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	OE
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

32-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED

### PIN DESCRIPTION

A0 – A17	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
V <sub>CC</sub>	– Power (+5V)
GND	– Ground
NC	– No Connect

lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. There is no limit on the number of write cycles which can be executed and no additional support circuitry is required for microprocessor interfacing.

### DESCRIPTION

The DS1249 2048K Nonvolatile SRAMs are 2,097,152-bit, fully static, nonvolatile SRAMs organized as 262,144 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the

**DALLAS**  
SEMICONDUCTOR

**DS1250Y/AB**  
4096K Nonvolatile SRAM

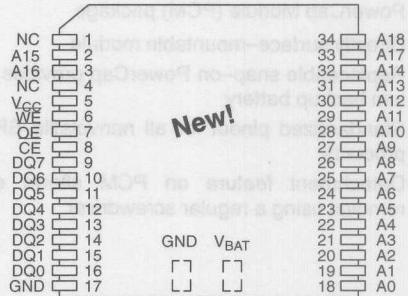
### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Replaces 512K x 8 volatile static RAM, EEPROM or Flash memory
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1250Y)
- Optional  $\pm 5\%$   $V_{CC}$  operating range (DS1250AB)
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND
- JEDEC standard 32-pin DIP package
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PCM allows easy removal using a regular screwdriver

### PIN ASSIGNMENT

A18	1	32	$V_{CC}$
A16	2	31	A15
A14	3	30	A17
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	OE
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

32-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0 – A18	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
$V_{CC}$	– Power (+5V)
GND	– Ground
NC	– No Charge



# DS1250W 3.3V 4096K Nonvolatile SRAM

## FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Replaces 512K x 8 volatile static RAM, EEPROM or Flash memory
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 150 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Optional industrial temperature range of -40°C to +85°C, designated IND
- JEDEC standard 32-pin DIP package
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PCM allows easy removal using a regular screwdriver

## PIN ASSIGNMENT

1	A18	32	V <sub>CC</sub>
2	A16	31	A15
3	A14	30	A17
4	A12	29	WE
5	A7	28	A13
6	A6	27	A8
7	A5	26	A9
8	A4	25	A11
9	A3	24	OE
10	A2	23	A10
11	A1	22	CE
12	A0	21	DQ7
13	DQ0	20	DQ6
14	DQ1	19	DQ5
15	DQ2	18	DQ4
16	GND	17	DQ3

32-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

## PIN DESCRIPTION

A0 – A18	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
V <sub>CC</sub>	– Power (+3.3V)
GND	– Ground
NC	– No Charge

**DALLAS**  
SEMICONDUCTOR

**DS1258Y/AB**  
128K x 16 Nonvolatile SRAM

### FEATURES

- 10 year minimum data retention in the absence of external power
- Data is automatically protected during a power loss
- Separate upper byte and lower byte chip select inputs
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$  operating range (DS1258Y)
- Optional  $\pm 5\%$  operating range (DS1258AB)

### PIN ASSIGNMENT

CEU	1	40	V <sub>CC</sub>
CEL	2	39	WE
DQ15	3	38	A16
DQ14	4	37	A15
DQ13	5	36	A14
DQ12	6	35	A13
DQ11	7	34	A12
DQ10	8	33	A11
DQ9	9	32	A10
DQ8	10	31	A9
GND	11	30	GND
DQ7	12	29	A8
DQ6	13	28	A7
DQ5	14	27	A6
DQ4	15	26	A5
DQ3	16	25	A4
DQ2	17	24	A3
DQ1	18	23	A2
DQ0	19	22	A1
OE	20	21	A0

40-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED

### PIN DESCRIPTION

A0-A16	— Address Inputs
DQ0-DQ15	— Data In/Data Out
CEU	— Chip Enable Upper Byte
CEL	— Chip Enable Lower Byte
WE	— Write Enable
OE	— Output Enable
V <sub>CC</sub>	— Power Supply (+5V)
GND	— Ground

### DESCRIPTION

The DS1258 128K x 16 Nonvolatile SRAMs are 2,097,152-bit fully static, nonvolatile SRAMs, organized as 131,072 words by 16 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and

write protection is unconditionally enabled to prevent data corruption. DIP-package DS1258 devices can be used in place of solutions which build nonvolatile 128K x 16 memory by utilizing a variety of discrete components. There is no limit on the number of write cycles that can be executed and no additional support circuitry is required for microprocessor interfacing.

**DALLAS**  
SEMICONDUCTOR

**DS1258W**  
3.3V 128K x 16 Nonvolatile SRAM

## FEATURES

- 10 year minimum data retention in the absence of external power
- Data is automatically protected during a power loss
- Separate upper byte and lower byte chip select inputs
- Unlimited write cycles
- Low-power CMOS
- Read and write access times as fast as 150 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time

## PIN ASSIGNMENT

CEU	1	40	V <sub>CC</sub>
CEL	2	39	WE
DQ15	3	38	A16
DQ14	4	37	A15
DQ13	5	36	A14
DQ12	6	35	A13
DQ11	7	34	A12
DQ10	8	33	A11
DQ9	9	32	A10
DQ8	10	31	A9
GND	11	30	GND
DQ7	12	29	A8
DQ6	13	28	A7
DQ5	14	27	A6
DQ4	15	26	A5
DQ3	16	25	A4
DQ2	17	24	A3
DQ1	18	23	A2
DQ0	19	22	A1
OE	20	21	A0

40-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED

## PIN DESCRIPTION

A0-A16	— Address Inputs
DQ0-DQ15	— Data In/Data Out
CEU	— Chip Enable Upper Byte
CEL	— Chip Enable Lower Byte
WE	— Write Enable
OE	— Output Enable
V <sub>CC</sub>	— Power Supply (+3.3V)
GND	— Ground

## DESCRIPTION

The DS1258W 3.3V 128K x 16 Nonvolatile SRAM is a 2,097,152-bit fully static, nonvolatile SRAM, organized as 131,072 words by 16 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and

write protection is unconditionally enabled to prevent data corruption. DIP-package DS1258W devices can be used in place of solutions which build nonvolatile 128K x 16 memory by utilizing a variety of discrete components. There is no limit on the number of write cycles that can be executed and no additional support circuitry is required for microprocessor interfacing.

# DALLAS SEMICONDUCTOR

## DS1265Y/AB 8M Nonvolatile SRAM

### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Unlimited write cycles
- Low-power CMOS operation
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1265Y)
- Optional  $\pm 5\%$   $V_{CC}$  operating range (DS1265AB)
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND

### PIN ASSIGNMENT

NC	1	36	$V_{CC}$
NC	2	35	A19
A18	3	34	NC
A16	4	33	A15
A14	5	32	A17
A12	6	31	$\overline{WE}$
A7	7	30	A13
A6	8	29	A8
A5	9	28	A9
A4	10	27	A11
A3	11	26	$\overline{OE}$
A2	12	25	A10
A1	13	24	$\overline{CE}$
A0	14	23	DQ7
DQ0	15	22	DQ6
DQ1	16	21	DQ5
DQ2	17	20	DQ4
GND	18	19	DQ3

36-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED

### PIN DESCRIPTION

A0 – A19	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
$V_{CC}$	– Power (+5V)
GND	– Ground
NC	– No Connect

### DESCRIPTION

The DS1265 8M Nonvolatile SRAMs are 8,388,608-bit, fully static nonvolatile SRAMs organized as 1,048,576 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy

source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. There is no limit on the number of write cycles which can be executed and no additional support circuitry is required for microprocessor interfacing.

# DALLAS SEMICONDUCTOR

## DS1270Y/AB 16M Nonvolatile SRAM

### FEATURES

- 5 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Unlimited write cycles
- Low-power CMOS operation
- Read and write access times as fast as 70 ns
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1270Y)
- Optional  $\pm 5\%$   $V_{CC}$  operating range (DS1270AB)
- Optional industrial temperature range of  $-40^\circ C$  to  $+85^\circ C$ , designated IND

### PIN ASSIGNMENT

	Pin Number	Pin Description
NC	1	V <sub>CC</sub> (optional)
A20	2	A19
A18	3	NC
A16	4	A15
A14	5	WE
A12	6	A13
A7	7	A8
A6	8	A9
A5	9	A11
A4	10	OE
A3	11	A10
A2	12	CE
A1	13	DQ7
A0	14	DQ6
DQ0	15	DQ5
DQ1	16	DQ4
DQ2	17	DQ3
GND	18	
	36	

36-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED

### PIN DESCRIPTION

A0 – A20	– Address Inputs
DQ0 – DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
V <sub>CC</sub>	– Power (+5V)
GND	– Ground
NC	– No Connect

### DESCRIPTION

The DS1270 16M Nonvolatile SRAMs are 16,777,216-bit, fully static nonvolatile SRAMs organized as 2,097,152 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the

lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. There is no limit on the number of write cycles which can be executed and no additional support circuitry is required for microprocessor interfacing.

**DALLAS**  
SEMICONDUCTOR

# DS1330Y/AB

## 256K Nonvolatile SRAM with Battery Monitor

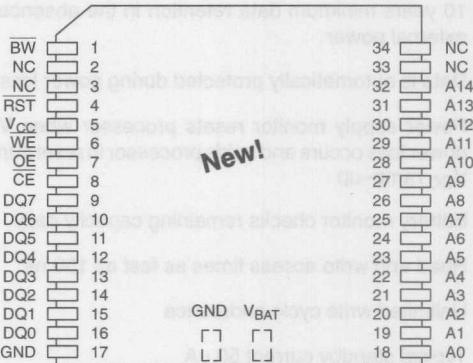
### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Power supply monitor resets processor when  $V_{CC}$  power loss occurs and holds processor in reset during  $V_{CC}$  ramp-up
- Battery monitor checks remaining capacity daily
- Read and write access times as fast as 70 ns
- Unlimited write cycle endurance
- Typical standby current 50  $\mu$ A
- Upgrade for 32K x 8 SRAM, EEPROM or Flash
- Lithium battery is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1330Y) or optional  $\pm 5\%$   $V_{CC}$  operating range (DS1330AB)
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

### DESCRIPTION

The DS1330 256K Nonvolatile SRAMs are 262,144-bit, fully static, nonvolatile SRAMs organized as 32,768 words by eight bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

### PIN ASSIGNMENT



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0-A14	– Address Inputs
DQ0-DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
RST	– Reset Output
BW	– Battery Warning Output
V <sub>CC</sub>	– Power (+5 Volts)
GND	– Ground
NC	– No Connect

Additionally, the DS1330 devices have dedicated circuitry for monitoring the status of  $V_{CC}$  and the status of the internal lithium battery. DS1330 devices in the PowerCap Module package are directly surface mountable and are normally paired with a DS9034PC PowerCap to form a complete Nonvolatile SRAM module. The devices can be used in place of 32K x 8 SRAM, EEPROM or Flash components.

**DALLAS**  
SEMICONDUCTOR

# DS1330W

## 3.3V 256K Nonvolatile SRAM with Battery Monitor

### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Power supply monitor resets processor when  $V_{CC}$  power loss occurs and holds processor in reset during  $V_{CC}$  ramp-up
- Battery monitor checks remaining capacity daily
- Read and write access times as fast as 150 ns
- Unlimited write cycle endurance
- Typical standby current 50  $\mu$ A
- Upgrade for 32K x 8 SRAM, EEPROM or Flash
- Lithium battery is electrically disconnected to retain freshness until power is applied for the first time
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

### DESCRIPTION

The DS1330W 3.3V 256K Nonvolatile SRAM is a 262,144-bit, fully static, nonvolatile SRAM organized as 32,768 words by eight bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent

### PIN ASSIGNMENT



New!

34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0-A14	– Address Inputs
DQ0-DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
RST	– Reset Output
BW	– Battery Warning Output
Vcc	– Power (+3.3 Volts)
GND	– Ground
NC	– No Connect

data corruption. Additionally, the DS1330W has dedicated circuitry for monitoring the status of  $V_{CC}$  and the status of the internal lithium battery. DS1330W devices in the PowerCap Module package are directly surface mountable and are normally paired with a DS9034PC PowerCap to form a complete Nonvolatile SRAM module. The devices can be used in place of 32K x 8 SRAM, EEPROM or Flash components.

**DALLAS**  
SEMICONDUCTOR

## DS1345Y/AB 1024K Nonvolatile SRAM with Battery Monitor

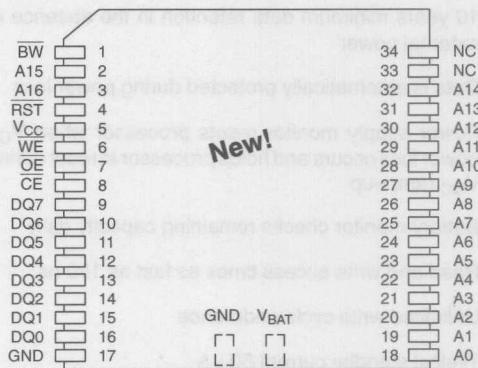
### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Power supply monitor resets processor when  $V_{CC}$  power loss occurs and holds processor in reset during  $V_{CC}$  ramp-up
- Battery monitor checks remaining capacity daily
- Read and write access times as fast as 70 ns
- Unlimited write cycle endurance
- Typical standby current 50  $\mu$ A
- Upgrade for 128K x 8 SRAM, EEPROM or Flash
- Lithium battery is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1345Y) or optional  $\pm 5\%$   $V_{CC}$  operating range (DS1345AB)
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

### DESCRIPTION

The DS1345 1024K Nonvolatile SRAMs are 1,048,576-bit, fully static, nonvolatile SRAMs organized as 131,072 words by eight bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent

### PIN ASSIGNMENT



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0–A16	– Address Inputs
DQ0–DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
RST	– Reset Output
BW	– Battery Warning Output
$V_{CC}$	– Power (+5 Volts)
GND	– Ground
NC	– No Connect

data corruption. Additionally, the DS1345 devices have dedicated circuitry for monitoring the status of  $V_{CC}$  and the status of the internal lithium battery. DS1345 devices in the PowerCap Module package are directly surface mountable and are normally paired with a DS9034PC PowerCap to form a complete Nonvolatile SRAM module. The devices can be used in place of 128K x 8 SRAM, EEPROM or Flash components.

**DALLAS**  
SEMICONDUCTOR

# DS1345W

## 3.3V 1024K Nonvolatile SRAM with Battery Monitor

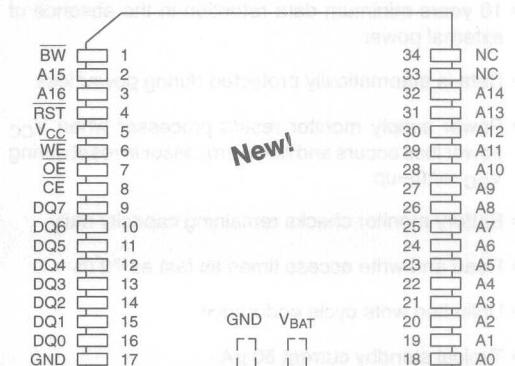
### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Power supply monitor resets processor when  $V_{CC}$  power loss occurs and holds processor in reset during  $V_{CC}$  ramp-up
- Battery monitor checks remaining capacity daily
- Read and write access times as fast as 150 ns
- Unlimited write cycle endurance
- Typical standby current 50  $\mu$ A
- Upgrade for 128K x 8 SRAM, EEPROM or Flash
- Lithium battery is electrically disconnected to retain freshness until power is applied for the first time
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

### DESCRIPTION

The DS1345W 3.3V 1024K Nonvolatile SRAM is a 1,048,576-bit, fully static, nonvolatile SRAM organized as 131,072 words by eight bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent

### PIN ASSIGNMENT



New!

34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0-A16	– Address Inputs
DQ0-DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
RST	– Reset Output
BW	– Battery Warning Output
VCC	– Power (+3.3 Volts)
GND	– Ground
NC	– No Connect

data corruption. Additionally, the DS1345W has dedicated circuitry for monitoring the status of  $V_{CC}$  and the status of the internal lithium battery. DS1345W devices in the PowerCap Module package are directly surface mountable and are normally paired with a DS9034PC PowerCap to form a complete Nonvolatile SRAM module. The devices can be used in place of 128K x 8 SRAM, EEPROM or Flash components.

**DALLAS**  
SEMICONDUCTOR

# DS1350Y/AB

## 4096K Nonvolatile SRAM with Battery Monitor

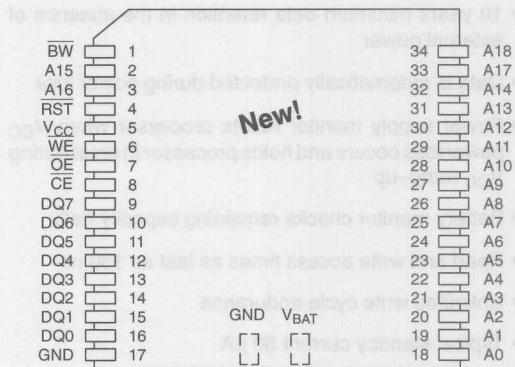
### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Power supply monitor resets processor when  $V_{CC}$  power loss occurs and holds processor in reset during  $V_{CC}$  ramp-up
- Battery monitor checks remaining capacity daily
- Read and write access times as fast as 70 ns
- Unlimited write cycle endurance
- Typical standby current 50  $\mu$ A
- Upgrade for 512K x 8 SRAM, EEPROM or Flash
- Lithium battery is electrically disconnected to retain freshness until power is applied for the first time
- Full  $\pm 10\%$   $V_{CC}$  operating range (DS1350Y) or optional  $\pm 5\%$   $V_{CC}$  operating range (DS1350AB)
- Optional industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , designated IND
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

### DESCRIPTION

The DS1350 4096K Nonvolatile SRAMs are 4,194,304-bit, fully static, nonvolatile SRAMs organized as 524,288 words by eight bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent

### PIN ASSIGNMENT



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0-A18	– Address Inputs
DQ0-DQ7	– Data In/Data Out
CE	– Chip Enable
WE	– Write Enable
OE	– Output Enable
RST	– Reset Output
BW	– Battery Warning Output
VCC	– Power (+5 Volts)
GND	– Ground
NC	– No Connect

data corruption. Additionally, the DS1350 devices have dedicated circuitry for monitoring the status of  $V_{CC}$  and the status of the internal lithium battery. DS1350 devices in the PowerCap Module package are directly surface mountable and are normally paired with a DS9034PC PowerCap to form a complete Nonvolatile SRAM module. The devices can be used in place of 512K x 8 SRAM, EEPROM or Flash components.

**DALLAS**  
SEMICONDUCTOR

# DS1350W

## 3.3V 4096K Nonvolatile SRAM with Battery Monitor

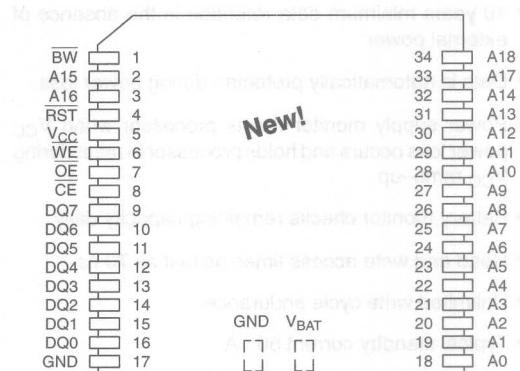
### FEATURES

- 10 years minimum data retention in the absence of external power
- Data is automatically protected during power loss
- Power supply monitor resets processor when  $V_{CC}$  power loss occurs and holds processor in reset during  $V_{CC}$  ramp-up
- Battery monitor checks remaining capacity daily
- Read and write access times as fast as 150 ns
- Unlimited write cycle endurance
- Typical standby current 50  $\mu$ A
- Upgrade for 512K x 8 SRAM, EEPROM or Flash
- Lithium battery is electrically disconnected to retain freshness until power is applied for the first time
- Optional industrial temperature range of -40°C to +85°C, designated IND
- New PowerCap Module (PCM) package
  - Directly surface-mountable module
  - Replaceable snap-on PowerCap provides lithium backup battery
  - Standardized pinout for all nonvolatile SRAM products
  - Detachment feature on PowerCap allows easy removal using a regular screwdriver

### DESCRIPTION

The DS1350W 3.3V 4096K Nonvolatile SRAM is a 4,194,304-bit, fully static, nonvolatile SRAM organized as 524,288 words by eight bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent

### PIN ASSIGNMENT



34-PIN POWERCAP MODULE (PCM)  
(USES DS9034PC POWERCAP)

### PIN DESCRIPTION

A0-A18	Address Inputs
DQ0-DQ7	Data In/Data Out
CE	Chip Enable
WE	Write Enable
OE	Output Enable
RST	Reset Output
BW	Battery Warning Output
Vcc	Power (+3.3 Volts)
GND	Ground
NC	No Connect

data corruption. Additionally, the DS1350W has dedicated circuitry for monitoring the status of  $V_{CC}$  and the status of the internal lithium battery. DS1350W devices in the PowerCap Module package are directly surface mountable and are normally paired with a DS9034PC PowerCap to form a complete Nonvolatile SRAM module. The devices can be used in place of 512K x 8 SRAM, EEPROM or Flash components.

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**DS1380**  
RAMport

## FEATURES

- 2K x 8 static RAM
- 8-Bit transparent I/O port
- Battery connection provided for nonvolatility
- Multiplexed address/data bus reduces pin count
- 5% or 10% V<sub>CC</sub> tolerance
- Power Fail output signal
- Low power CMOS
- 24-pin DIP package or optional 24-pin SOIC
- Ideally suited for microcontroller applications as add-on memory

## PIN ASSIGNMENT

TOL	1	24	V <sub>CC</sub>
PF	2	23	CLK
PI1	3	22	PO8
PO1	4	21	PI8
PI2	5	20	V <sub>BAT</sub>
PO2	6	19	MEM
PI3	7	18	PO7
PO3	8	17	PI7
PI4	9	16	GND
PO4	10	15	PO6
PI5	11	14	PI6
GND	12	13	PO5

24-PIN DIP (600 MIL)  
24-PIN SOIC (300 MIL)

## PIN DESCRIPTION

PI1 – PI8	– Port Inputs ( $\mu$ P Ports)
PO1 – PO8	– Port Outputs (External Ports)
PF	– Power Fail Output
CLK	– Clock
MEM	– Memory Select
V <sub>BAT</sub>	– + Battery Connection
V <sub>CC</sub>	– +5 Volts
GND	– Ground

## DESCRIPTION

The DS1380 is a 2K x 8 nonvolatile static RAM designed to connect directly to the port pins of a microcontroller. Eight of ten port pins required to interface with the microcontroller are reproduced by the DS1380 for general purpose use. The reproduced port pins can be both inputs and outputs and will appear exactly the same as the pins on the attached microcontroller. The static RAM is read or written with three successive cycles con-

taining high order address, low order address and then data. Read, write and status information is passed to the DS1380 along with the high order address transfer. While transferring data to and from memory, the I/O status is locked and maintained. All data within the DS1380 can be made nonvolatile with direct connection of a 3-volt lithium battery. The DS1380 is controlled by only two signals: clock and memory select.

**DALLAS**  
SEMICONDUCTOR

24-pin  
DS1381  
NV RAMport

## FEATURES

- 2K x 8 Nonvolatile Static RAM
- 8-Bit transparent I/O Port
- Greater than 10 years of data retention in absence of  $V_{CC}$
- Multiplexed address/data bus reduces pin count
- Write protection for both RAM and port status at either 5% or 10%
- Power Fail output signal
- Low power CMOS
- 24-pin DIP package
- Ideally suited for microcontroller applications as add-on memory

## PIN ASSIGNMENT

TOL	1	24	V <sub>CC</sub>
PF	2	23	CLK
PI1	3	22	PO8
PO1	4	21	PI8
PI2	5	20	NC
PO2	6	19	MEM
PI3	7	18	PO7
PO3	8	17	PI7
PI4	9	16	NC
PO4	10	15	PO6
PI5	11	14	PI6
GND	12	13	PO5, RD, CS
			PO4, RD, CS

24-PIN ENCAPSULATED PACKAGE

## PIN DESCRIPTION

PI1 – PI8	– Port Inputs ( $\mu$ P Ports)
PO1 – PO8	– Port Outputs (External Ports)
PF	– Power Fail Output
CLK	– Clock
MEM	– Memory Select
V <sub>CC</sub>	– +5 Volts
GND	– Ground
NC	– No Connection

Note: Pins 16 and 20 are missing by design.

## DESCRIPTION

The DS1381 is a 2K x 8 nonvolatile static RAM designed to connect directly to the port pins of a microcontroller. Eight of ten port pins required to interface with the microcontroller are reproduced by the DS1381 for general purpose use. The reproduced port pins can be both inputs and outputs and will appear exactly the same as the pins on the attached microcontroller. The static RAM is read or written with three successive cycles con-

taining high order address, low order address and then data. Read, write and status information is passed to the DS1381 along with the high order address transfer. While transferring data to and from memory, the I/O status is locked and maintained. All data within the DS1381 is nonvolatile and data retention time is over 10 years. The DS1381 is controlled by only two signals; clock and memory select.

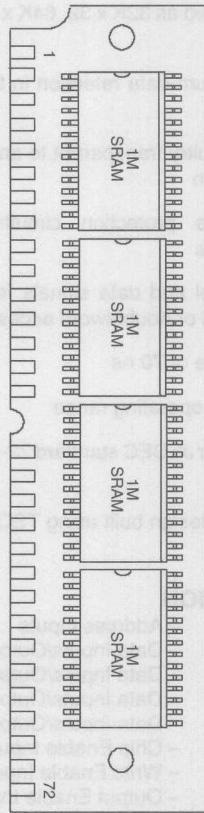
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**DS2227**  
Flexible NV SRAM Stik

### FEATURES

- Flexibly organized as 128K x 32, 256K x 16, or 512K x 8 bits
- Data retention >10 years in the absence of V<sub>CC</sub>
- Nonvolatile circuitry transparent to and independent from host system
- Automatic write protection circuitry safeguards against data loss
- Separate chip enables allow access by byte, word, or long word
- Fast access times: 70ns, 100ns, or 120ns
- Unlimited write cycles
- Read-cycle time equals write-cycle time
- Employs popular JEDEC standard 72-position SIMM connection scheme
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time

### PIN ASSIGNMENT



72-PIN SIP STIK

### DESCRIPTION

The DS2227 Flexible NV SRAM Stik is a self-contained 4,194,304-bit nonvolatile static RAM which can be flexibly organized as 128K x 32 bits, 256K x 16 bits, or 512K x 8 bits. The nonvolatile memory contains all necessary control circuitry and lithium energy sources to maintain

data integrity in the absence of power for more than 10 years. The DS2227 employs the popular JEDEC standard 72-position SIMM connection scheme, requiring no additional circuitry.

**DALLAS**  
SEMICONDUCTOR

**DS3803**  
1024K Flexible NV SRAM SIMM

### FEATURES

- Flexibly organized as 32K x 32, 64K x 16 or 128K x 8 bits
- 10 years minimum data retention in the absence of external power
- Nonvolatile circuitry transparent to and independent from host system
- Automatic write protection circuitry safeguards against data loss
- Separate control and data signals for each SRAM allow byte, word or doubleword access
- Fast access time of 70 ns
- Full  $V_{CC} \pm 10\%$  operating range
- Employs popular JEDEC standard 72-position SIMM connector
- Extremely thin design built using TSOP-package IC components

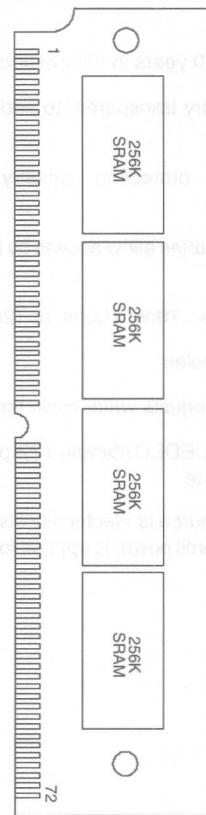
### PIN DESCRIPTION

A0 – A14	– Address Inputs
D0A – D7A	– Data Inputs/Outputs, Byte A
D0B – D7B	– Data Inputs/Outputs, Byte B
D0C – D7C	– Data Inputs/Outputs, Byte C
D0D – D7D	– Data Inputs/Outputs, Byte D
CEA – CED	– Chip Enable Inputs
WEA – WED	– Write Enable Inputs
OEA – OED	– Output Enable Inputs
VCC	– +5V Power Supply
GND	– Ground
NC	– No Connect

### DESCRIPTION

The DS3803 is a self-contained 1,048,576-bit, nonvolatile static RAM which can be flexibly organized as 32K x 32, 64K x 16 or 128K x 8. Built using four 32K x 8 SRAMs, four nonvolatile control ICs and four lithium batteries, this nonvolatile memory contains all necessary

### PIN ASSIGNMENT



DS3803 72-PIN SIMM

control circuitry and lithium energy sources to maintain data integrity in the absence of power for more than 10 years. The DS3803 employs the popular JEDEC standard 72-position SIMM connection scheme and requires no additional circuitry.

**DALLAS**  
**SEMICONDUCTOR**

**DS9034PC**  
PowerCap

## FEATURES

- Provides 10 years of battery backup power for Non-volatile SRAMs in the PowerCap Module (PCM) package
- Snaps directly onto a surface-mounted PowerCap module base to form a complete Nonvolatile SRAM module
- Attaches after module base has been surface-mounted to protect lithium battery from the high temperatures of reflow soldering
- Maintains mechanical and electrical connection with module base even during severe shock and vibration stresses
- Detachment feature allows easy removal using a regular screwdriver
- Periodic replacement allows Nonvolatile SRAM module life to be extended indefinitely
- Compatible with these PowerCap module bases:

DS1230YP/ABP/WP

DS1245YP/ABP/WP

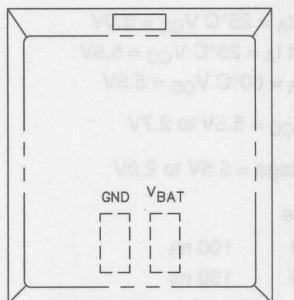
DS1250YP/ABP/WP

DS1330YP/ABP/WP

DS1345YP/ABP/WP

DS1350YP/ABP/WP

## PACKAGE OUTLINE



TOP VIEW



SIDE VIEW

## PIN DESCRIPTION

$V_{BAT}$	+3 Volt Battery Output
GND	- Ground

## ABSOLUTE MAXIMUM RATINGS

Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C

## BATTERY CHARACTERISTICS

Nominal Voltage	3 volts
Nominal Capacity	130 mAh
Chemistry	$Li(CF)_x$
Data Retention Life	10 Years (25°C)

incorrect attachment and is designed to maintain mechanical and electrical contact with its host module base even during severe mechanical shock and vibration. The DS9034PC is easily removed by inserting a regular screwdriver into the detachment feature and prying gently outward and upward to release the PowerCap from the module base.

## DESCRIPTION

The DS9034PC PowerCap is a snap-on lithium power source for Nonvolatile SRAMs in Dallas Semiconductor's directly surface-mountable PowerCap module base package. After a PowerCap module has been soldered in place and cleaned, the DS9034PC PowerCap is snapped onto the base to form a complete Nonvolatile SRAM module. The PowerCap is keyed to prevent

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SEMICONDUCTOR

**DS2016**  
2K x 8 3V/5V Operation Static RAM

### FEATURES

- Low power CMOS design
- Standby current
  - 50 nA max at  $t_A = 25^\circ\text{C}$   $V_{CC} = 3.0\text{V}$
  - 100 nA max at  $t_A = 25^\circ\text{C}$   $V_{CC} = 5.5\text{V}$
  - 1  $\mu\text{A}$  max at  $t_A = 60^\circ\text{C}$   $V_{CC} = 5.5\text{V}$
- Full operation for  $V_{CC} = 5.5\text{V}$  to 2.7V
- Data Retention Voltage = 5.5V to 2.0V
- Fast 5V access time
  - DS2016 – 100 100 ns
  - DS2016 – 150 150 ns
- Reduced-speed 3V access time
  - DS2016 – 100 250 ns
  - DS2016 – 150 250 ns
- Operating temperature range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- Full static operation
- TTL compatible inputs and outputs over voltage range of 5.5V to 2.7 volts.
- Available in 24-pin DIP and 24-pin SOIC packages
- Suitable for both battery-operate and battery backup applications

### DESCRIPTION

The DS2016 is a 16,384-bit, low-power, fully static random access memory organized as 2048 words by 8 bits using CMOS technology. The device operates from a single power supply with a voltage input between 2.7 and 5.5 volts. The chip enable input ( $\overline{CE}$ ) is used for device selection and can be used in order to achieve the minimum standby current mode, which facilitates both battery operate and battery backup applications. The device provides access times as fast as 100 ns when

### PIN ASSIGNMENT

A7	1	24	V <sub>CC</sub>
A6	2	23	A8
A5	3	22	A9
A4	4	21	WE
A3	5	20	OE
A2	6	19	A10
A1	7	18	CE
A0	8	17	DQ7
DQ0	9	16	DQ6
DQ1	10	15	DQ5
DQ2	11	14	DQ4
GND	12	13	DQ3

DS2016 24-PIN DIP (600 MIL)  
DS2016S 24-PIN SOIC (330 MIL)

### PIN DESCRIPTION

A0 – A10	– Address Inputs
DQ0 – DQ7	– Data Input/Output
$\overline{CE}$	– Chip Enable Input
$\overline{WE}$	– Write Enable Input
$\overline{OE}$	– Output Enable Input
V <sub>CC</sub>	– Power Supply Input 2.7V – 5.5V
GND	– Ground

operated from a 5-volt power supply input, and also provides relatively good performance of 250 ns access while operating from a 3-volt input. The device maintains TTL-level inputs and outputs over the input voltage range of 2.7 to 5.5 volts. The DS2016 is most suitable for low power applications where battery operation or battery backup for nonvolatility is required. The DS2016 is a JEDEC-standard 2K x 8 SRAM and is pin-compatible with ROM and EPROM of similar density.

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**DS2064**  
8K x 8 Static RAM

## FEATURES

- Low power CMOS design
- Standby current
  - 50 nA max at  $t_A = 25^\circ\text{C}$   $V_{CC} = 3.0\text{V}$
  - 100 nA max at  $t_A = 25^\circ\text{C}$   $V_{CC} = 5.5\text{V}$
  - 1  $\mu\text{A}$  max at  $t_A = 60^\circ\text{C}$   $V_{CC} = 5.5\text{V}$
- Full operation for  $V_{CC} = 4.5\text{V}$  to  $5.5\text{V}$
- Data Retention Voltage =  $5.5\text{V}$  to  $2.0\text{V}$
- Access time equals 200 ns at  $5.0\text{V}$
- Operating temperature range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- Full static operation
- TTL compatible inputs and outputs
- Available in 28-pin DIP and 28-pin SOIC packages
- Suitable for both battery operated and battery backup applications



## PIN ASSIGNMENT

NC	1	28	V <sub>CC</sub>
A12	2	27	WE
A7	3	26	CE2
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE1
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

DS2064-200 28-PIN DIP (600 MIL)  
DS2064S-200 28-PIN SOIC (330 MIL)

## PIN DESCRIPTION

A0-A12	— Address Inputs
DQ0-DQ7	— Data Input/Output
CE1, CE2	— Chip Enable Inputs
WE	— Write Enable Input
OE	— Output Enable Input
V <sub>CC</sub>	— 5V Power Supply Input
GND	— Ground
NC	— No Connection

## DESCRIPTION

The DS2064 is a 65536-bit low power, fully static random access memory organized as 8192 words by eight bits using CMOS technology. The device operates from a single power supply with a voltage input between 4.5V and 5.5V. The chip enable inputs (CE1 and CE2) are used for device selection and can be used in order to achieve the minimum standby current mode, which fa-

cilitates both battery operate and battery backup applications. The device provides fast access time of 200 ns and is most suitable for low power applications where battery operation or battery backup for nonvolatility is required. The DS2064 is a JEDEC-standard 8K x 8 SRAM and is pin-compatible with ROM and EPROM of similar density.

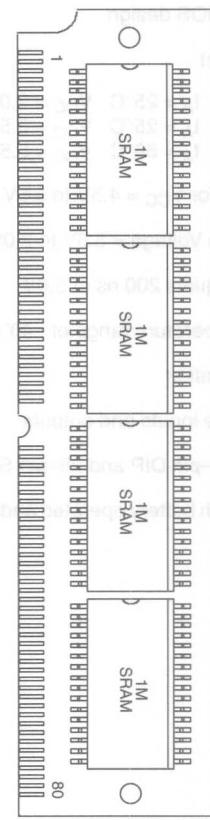
**DALLAS**  
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**DS2229**  
Word-Wide 8 Meg SRAM Stik

### FEATURES

- Organized as a high density 512K x 16 bit Stik™
- Fast access time of 85 ns
- Unlimited write cycles
- Employs popular JEDEC standard 80-position SIMM connector
- Full  $\pm 10\%$  operating range
- Read cycle time equals write cycle time
- Ultra-low standby current < 10  $\mu\text{A}$
- Suitable for battery-backed applications

### PIN ASSIGNMENT



80-PIN SIP Stik

### DESCRIPTION

The DS2229 is an 8,388,608-bit low-power, fully static Random Access Memory organized as 524,888 words by 16 bits using CMOS technology. The device employs the popular JEDEC standard 80-pin SIMM connection scheme with no additional circuitry required. The device operates from a single power supply with a voltage input of 4.5 to 5.5 volts. The Chip Enable inputs (CE0, CE1, CE2, CE3) are used for device selection and can be

used in order to achieve the minimum standby current mode which facilitates battery backup. The device provides a fast access time of 85 ns. The DS2229 maintains TTL levels over input voltage range 4.5V to 5.5V. The DS2229 is JEDEC pin-compatible (see Figure 1) with flash EEPROM memory SIMM boards of similar density.

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# DS1280

## 3-Wire to Bytewide Converter Chip

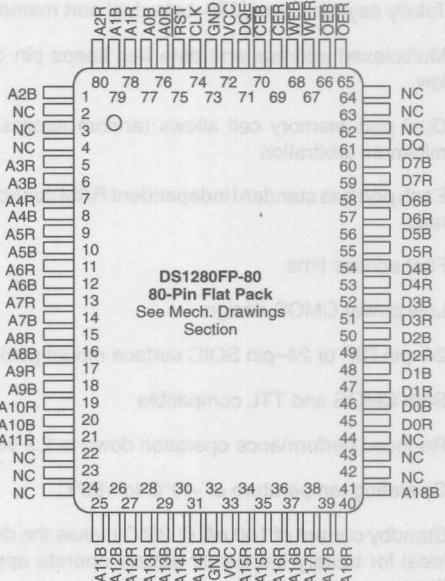
### FEATURES

- Adapts JEDEC bytewide memory to a 3-wire serial port
- Supports 512K bytes of memory
- 68-pin version provides arbitration mechanisms for dual port operation
- CMOS circuitry design for battery backup and battery operate applications
- Cyclic redundancy check monitors serial data transmission for error
- Available in 44- or 80-pin quad flat pack for high density requirements

### ORDERING INFORMATION

DS1280FP-XX -80 80-pin Flat Pack  
-44 44-pin Flat Pack

### PIN ASSIGNMENT

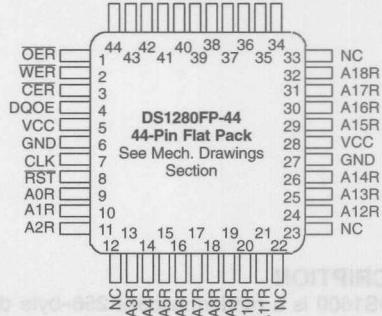


### PIN DESCRIPTION

RST	- Reset For Serial Port
DQ	- Data Input/Output For Serial Port
CLK	- Clock Input For Serial Port
DQE	- Serial Port Active Output
CER	- System Bus Enable
WER	- System Bus Read Enable
OER	- System Bus Write Enable
A0B-A18B	- System Address Bus
D0B-D7B	- System Data Bus
A0R-A18R	- RAM Address Bus
D0R-D7R	- RAM Data Bus
GND	- Ground
V <sub>CC</sub>	- +5 Volts

### DESCRIPTION

The DS1280 adds a 3-wire serial port to a bytewide static RAM yet maintains the existing bytewide port. Memory capacity of up to 512K bytes can be addressed directly. Arbitration between the serial and bytewide port is accomplished by handshaking or using predict-



able idle time as an access window. The serial port requires a 6-byte protocol to set up memory transfers. Cyclic redundancy check circuitry is included to monitor serial data transmission for error.

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SEMICONDUCTOR

**DS1609**  
Dual Port RAM

## FEATURES

- Totally asynchronous 256-byte dual port memory
- Multiplexed address and data bus keeps pin count low
- Dual port memory cell allows random access with minimum arbitration
- Each port has standard independent RAM control signals
- Fast access time
- Low power CMOS design
- 24-pin DIP or 24-pin SOIC surface mount package
- Both CMOS and TTL compatible
- Reduced performance operation down to 2.5 volts
- Operating temperature of -40°C to +85°C
- Standby current of 100 nA @ 25°C makes the device ideal for battery backup or battery operate applications.



## DESCRIPTION

The DS1609 is a random access 256-byte dual port memory designed to connect two asynchronous address/data buses together with a common memory element. Both ports have unrestricted access to all 256 bytes of memory and with modest system discipline no arbitration is required. Each port is controlled by

## PIN ASSIGNMENT

	PORT A	PORT B
AD7 <sub>A</sub>	1	24
AD6 <sub>A</sub>	2	23
AD5 <sub>A</sub>	3	22
AD4 <sub>A</sub>	4	21
AD3 <sub>A</sub>	5	20
AD2 <sub>A</sub>	6	19
AD1 <sub>A</sub>	7	18
AD0 <sub>A</sub>	8	17
WE <sub>A</sub>	9	16
CE <sub>A</sub>	10	15
OE <sub>A</sub>	11	14
GND	12	13

DS1609 24-PIN DIP (600 MIL)  
See Mech. Drawing Section

	PORT A	PORT B
AD7 <sub>A</sub>	1	24
AD6 <sub>A</sub>	2	23
AD5 <sub>A</sub>	3	22
AD4 <sub>A</sub>	4	21
AD3 <sub>A</sub>	5	20
AD2 <sub>A</sub>	6	19
AD1 <sub>A</sub>	7	18
AD0 <sub>A</sub>	8	17
WE <sub>A</sub>	9	16
CE <sub>A</sub>	10	15
OE <sub>A</sub>	11	14
GND	12	13

DS1609S 24-PIN SOIC (300 MIL)  
See Mech. Drawing Section

## PIN DESCRIPTION

AD0-AD7	— Port address/data
CE	— Port enable
WE	— Write enable
OE	— Output enable
V <sub>CC</sub>	+5 volt supply
GND	— Ground

three control signals: output enable, write enable, and port enable. The device is packaged in plastic 24-pin DIP and 24-pin SOIC. Output enable access time of 50 ns is available when operating at 5 volts. Reduced performance operation at reduced voltage can be achieved down to 2.5 volts.

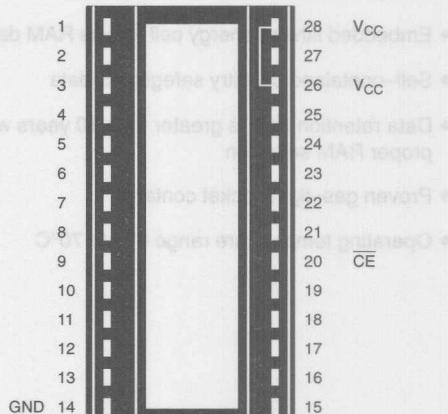
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## DS1213B SmartSocket 16K/64K

### FEATURES

- Accepts standard 2K x 8 or 8K x 8 CMOS static RAMs
- Embedded lithium energy cell retains RAM data
- Self-contained circuitry safeguards data
- Data retention time is greater than 10 years with the proper RAM selection
- IC socket permits upgrading from 2K x 8 to 8K x 8 RAM
- Proven gas-tight socket contacts
- Operating temperature range 0°C to 70°C

### PIN ASSIGNMENT



28-PIN INTELLIGENT SOCKET

### PIN DESCRIPTION

CE	— Conditioned Chip Enable
V <sub>CC</sub>	— Switched V <sub>CC</sub>
GND	— Ground

All pins pass through except 20, 26 and 28.

### DESCRIPTION

The DS1213B SmartSocket is a 28-pin, 600 mil DIP socket with a built-in CMOS controller circuit and an embedded lithium energy source. It accepts either 24-pin 2K x 8 (lower-justified) or 28-pin 8K x 8 JEDEC bytewise CMOS static RAM. When the socket is mated with a CMOS RAM, it provides a complete solution to problems associated with memory volatility. The Smart-Socket monitors incoming V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the internal

lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

Using the SmartSocket saves printed circuit board space since the SRAM/SmartSocket combination occupies no more area than the SRAM alone. The Smart-Socket modifies only pins 20, 26 and 28, to nonvolatileize the RAM. All other pins are passed straight through.

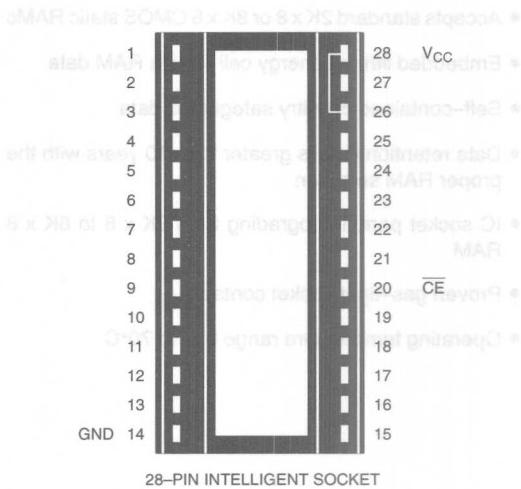
**DALLAS**  
SEMICONDUCTOR

**DS1213C**  
SmartSocket 256K

## FEATURES

- Accepts standard 32K x 8 CMOS static RAMs
- Embedded lithium energy cell retains RAM data
- Self-contained circuitry safeguards data
- Data retention time is greater than 10 years with the proper RAM selection
- Proven gas-tight socket contacts
- Operating temperature range 0°C to 70°C

## PIN ASSIGNMENT



28-PIN INTELLIGENT SOCKET

## PIN DESCRIPTION

CE — Conditioned Chip Enable

V<sub>CC</sub> — Switched V<sub>CC</sub>

GND — Ground

All pins pass through except 20 and 28.

## DESCRIPTION

The DS1213C SmartSocket is a 28-pin, 600 mil DIP socket with a built-in CMOS controller circuit and an embedded lithium energy source. It accepts a 32K x 8 JEDEC bytewide CMOS static RAM. When the socket is mated with a CMOS RAM, it provides a complete solution to problems associated with memory volatility. The SmartSocket monitors incoming V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, the internal lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

Using the SmartSocket saves printed circuit board space since the SRAM/SmartSocket combination occupies no more area than the memory alone. The SmartSocket uses only Pins 20 and 28 for RAM control. All other pins are passed straight through. See the DS1213B SmartSocket data sheet for technical details.

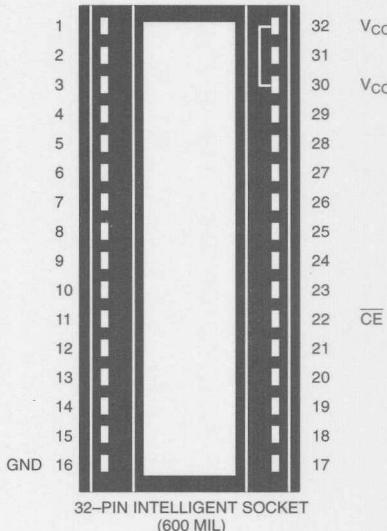
**DALLAS**  
SEMICONDUCTOR

**DS1213D**  
SmartSocket 256K/1M

### FEATURES

- Accepts standard 32K x 8 or 128K x 8 CMOS static RAMs
- Embedded lithium energy cell retains RAM data
- Self-contained circuitry safeguards data
- Data retention time is greater than 10 years with the proper RAM selection
- IC socket permits upgrading from 32K x 8 to 128K x 8 RAM
- Proven gas-tight socket contacts
- Operating temperature range 0°C to 70°C

### PIN ASSIGNMENT



### PIN DESCRIPTION

CE	— Conditioned Chip Enable
V <sub>CC</sub>	— Switched V <sub>CC</sub>
GND	— Ground

All pins pass through except 22, 30 and 32.

### DESCRIPTION

The DS1213D SmartSocket is a 32-pin, 600 mil DIP socket with a built-in CMOS controller circuit and an embedded lithium energy source. It accepts 32K x 8 or 128K x 8 JEDEC bytewide CMOS static RAM. When the socket is mated with a CMOS RAM, it provides a complete solution to problems associated with memory volatility. The SmartSocket monitors incoming V<sub>CC</sub> for an out-of-tolerance condition. When such a condition occurs, an internal lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

Using the SmartSocket saves printed circuit board space since the SRAM/SmartSocket combination occupies no more area than the SRAM alone. The SmartSocket uses only Pins 22, 30 and 32 for RAM control. All other pins are passed straight through.

See the DS1213B SmartSocket data sheet for technical details.

See Dallas Semiconductor Application Note 4 for modification instructions to allow use of 512K x 8 RAM with this part.



## DS280C310

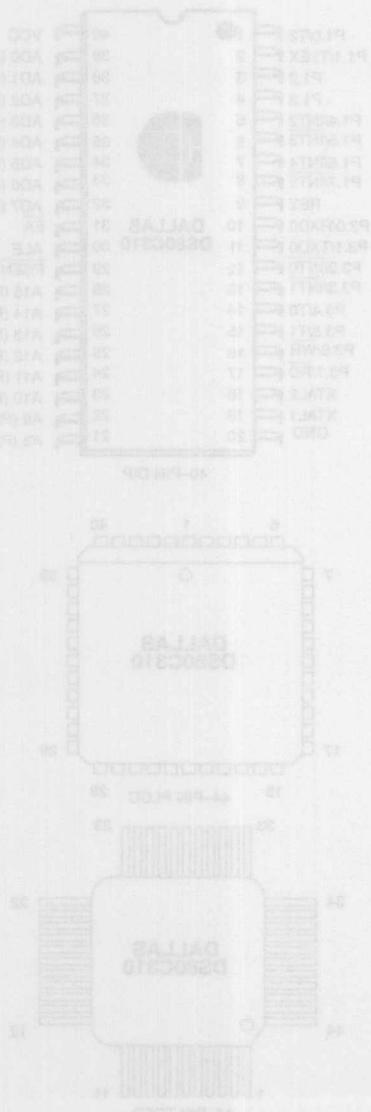
### High-Speed Microcontroller

# MICROCONTROLLERS

## High-Speed Microcontrollers

### Secure Microcontrollers

#### PACKAGE OUTLINE



#### FEATURES

- 32-Bit Cryptographic Controller
- 8085 Pin Compatible API
- Full-duplex Serial Port
- True 32-Bit Microcontroller
- MAR Register Set 828
- Dual 8-Bit Data Registers
- MAR ROM bank, ROM, RAM, EEPROM
- High-Speed Microcontroller
- SPI = I<sub>C</sub> Bus Emulation
- Run QD ROM Code Directly
- 8-Bit TST Instruction Set
- Single-Byte Instructions
- Dual Stack Pointer
- On-chip Boot ROM
- On-chip MAR ROM
- 16-Bit Internal Source With 8 External
- Internal Power On Reset Circuit
- Unwired Outputs With DS280C310
- Available in 40-Pin PDIP, 44-Pin TCC, and 44-Pin TQFP

#### DESCRIPTION

The DS280C310 is a fast 32-bit SOC/SOCB controller microcontroller. It features a 32-bit RISC processor core with 16KB of ROM code memory, 16KB of RAM data memory, and 16KB of EEPROM non-volatile memory. The DS280C310 also includes a 16-bit timer, a 16-bit counter/timer, a 16-bit serial port, and a 16-bit parallel port. The DS280C310 is designed for high-speed data processing and secure communication applications.

**DALLAS**  
SEMICONDUCTOR

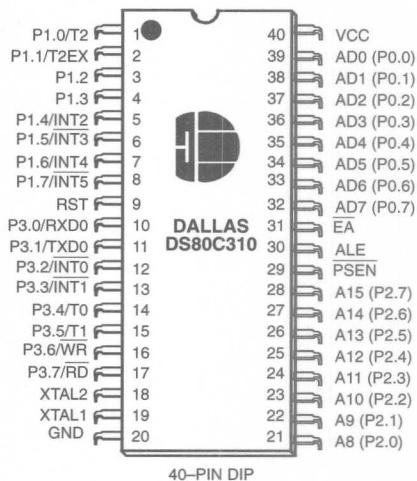
# DS80C310

## High-Speed Micro

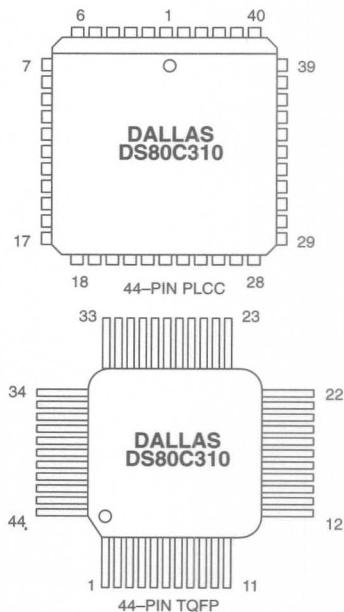
### FEATURES

- 80C32 Compatible
  - 8051 pin and instruction set compatible
  - Full duplex serial port
  - Three 16-bit timer/counters
  - 256 bytes scratchpad RAM
  - Multiplexed address/data bus
  - Addresses 64KB ROM and 64KB RAM
- High-Speed Architecture
  - 4 clocks/machine cycle (8051 = 12)
  - Runs DC to 33 MHz clock rates
  - Single-cycle instruction in 121 ns
  - Dual data pointer
  - Optional variable length MOVX to access fast/slow RAM /peripherals
- 10 total interrupt sources with 6 external
- Internal power on reset circuit
- Upwardly compatible with the DS80C320
- Available in 40-pin PDIP, 44-pin PLCC, and 44-pin TQFP

### PACKAGE OUTLINE



40-PIN DIP



### DESCRIPTION

The DS80C310 is a fast 80C31/80C32 compatible microcontroller. It features a redesigned processor core without wasted clock and memory cycles. As a result, it executes every 8051 instruction between 1.5 and 3 times faster than the original architecture for the same crystal speed. Typical applications will see a speed improvement of 2.5 times using the same code and the same crystal. The DS80C310 offers a maximum crystal speed of 33 MHz, resulting in apparent execution speeds of 82.5 MHz (approximately 2.5X).



## DS80C320/DS80C323

### High-Speed/Low-Power Micro

#### FEATURES

- 80C32-Compatible
  - 8051 Pin and instruction set compatible
  - Four 8-bit I/O ports
  - Three 16-bit timer/counters
  - 256 bytes scratchpad RAM
  - Addresses 64KB ROM and 64KB RAM
- High-speed architecture
  - 4 clocks/machine cycle (8032=12)
  - DC to 33 MHz (DS80C320)
  - DC to 18 MHz (DS80C323)
  - Single-cycle instruction in 121 ns
  - Uses less power for equivalent work
  - Dual data pointer
  - Optional variable length MOVX to access fast/slow RAM/peripherals
- High integration controller includes:
  - Power-fail reset
  - Programmable Watchdog timer
  - Early-warning power-fail interrupt
- Two full-duplex hardware serial ports
- 13 total interrupt sources with six external
- Available in 40-pin DIP, 44-pin PLCC and TQFP

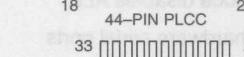
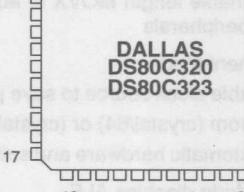
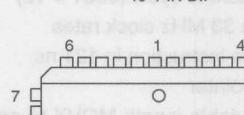
#### DESCRIPTION

The DS80C320/DS80C323 is a fast 80C31/80C32-compatible microcontroller. Wasted clock and memory cycles have been removed using a redesigned processor core. As a result, every 8051 instruction is executed between 1.5 and 3 times faster than the original for the same crystal speed. Typical applications will see a speed improvement of 2.5 times using the same code and same crystal. The DS80C320 offers a maximum crystal rate of 33 MHz, resulting in apparent execution speeds of 82.5 MHz (approximately 2.5X).

#### PIN ASSIGNMENT

P1.0/T2	1	VCC
P1.1/T2EX	2	AD0
P1.2/RXD1	3	AD1
P1.3/TXD1	4	AD2
P1.4/INT2	5	AD3
P1.5/INT3	6	AD4
P1.6/INT4	7	AD5
P1.7/INT5	8	AD6
RST	9	AD7
P3.0/RXD0	10	DALLAS
P3.1/TXD0	11	DS80C320
P3.2/INT0	12	DS80C323
P3.3/INT1	13	
P3.4/T0	14	A15 (P2.7)
P3.5/T1	15	A14 (P2.6)
P3.6/WR	16	A13 (P2.5)
P3.7/RD	17	A12 (P2.4)
XTAL2	18	A11 (P2.3)
XTAL1	19	A10 (P2.2)
GND	20	A9 (P2.1)
	21	A8 (P2.0)

(1 = 1.00 mm)





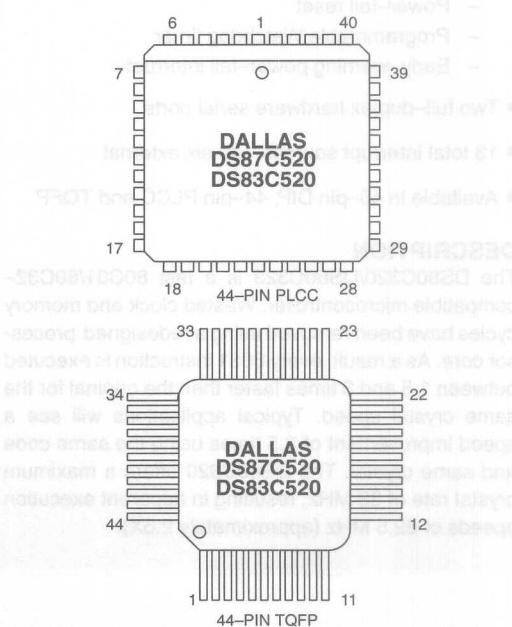
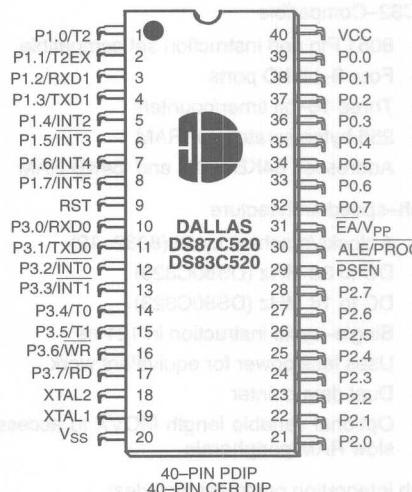
# DS87C520/DS83C520

## EPROM/ROM High-Speed Micro

### FEATURES

- 80C52 compatible
  - 8051 pin and instruction set compatible
  - Four 8-bit I/O ports
  - Three 16-bit timer/counters
  - 256 bytes scratchpad RAM
- Large On-chip Memory
  - 16KB Program Memory
  - 1KB extra on-chip SRAM for MOVX
- ROMSIZE Feature
  - Selects internal ROM size from 0 to 16KB
  - Allows access to entire external memory map
  - Dynamically adjustable by software
  - Useful as boot block for external FLASH
- High-Speed Architecture
  - 4 clocks/machine cycle (8051 = 12)
  - Runs DC to 33 MHz clock rates
  - Single-cycle instruction in 121 ns
  - Dual data pointer
  - Optional variable length MOVX to access fast/slow RAM/peripherals
- Power Management Mode
  - Programmable clock source to save power
  - CPU runs from (crystal/64) or (crystal/1024)
  - Provides automatic hardware and software exit
- EMI Reduction Mode disables ALE
- Two full-duplex hardware serial ports
- High integration controller includes:
  - Power-fail reset
  - Early-warning power-fail interrupt
  - Programmable Watchdog timer
- 13 total interrupt sources with 6 external
- Available in 40-pin PDIP, 44-pin PLCC, 44-pin TQFP, and 40-pin windowed CERDIP
- Factory Mask DS83C520 or EPROM (OTP) DS87C520

### PACKAGE OUTLINE



**DALLAS**  
SEMICONDUCTOR

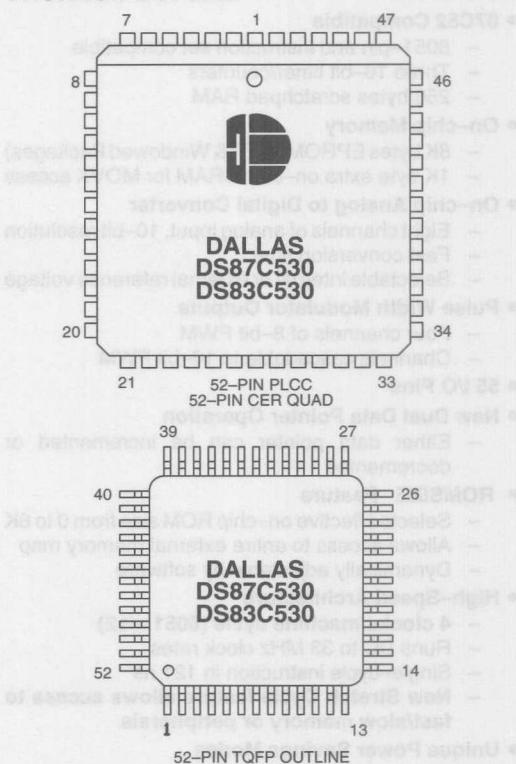
# DS87C530/DS83C530

## EPROM/ROM Micro with Real Time Clock

### FEATURES

- 80C52 Compatible
  - 8051 Instruction set compatible
  - Four 8-bit I/O ports
  - Three 16-bit timer/counters
  - 256 bytes scratchpad RAM
- Large On-chip Memory
  - 16KB EPROM (OTP)
  - 1KB extra on-chip SRAM for MOVX
- ROMSIZE Feature
  - Selects effective on-chip ROM size from 0 to 16KB
  - Allows access to entire external memory map
  - Dynamically adjustable by software
  - Useful as boot block for external Flash
- Nonvolatile Functions
  - **On-chip Real Time Clock w/ Alarm Interrupt**
  - **Battery backup support of 1KB SRAM**
- High-Speed Architecture
  - 4 clocks/machine cycle (8051 = 12)
  - Runs DC to 33 MHz clock rates
  - Single-cycle instruction in 121 ns
  - Dual data pointer
  - Optional variable length MOVX to access fast/slow RAM /peripherals
- Power Management Mode
  - Programmable clock source saves power
  - Runs from (crystal/64) or (crystal/1024)
  - Provides automatic hardware and software exit
- EMI Reduction Mode disables ALE
- Two full-duplex hardware serial ports
- High integration controller includes:
  - Power-fail reset
  - Early-warning power-fail interrupt
  - Programmable Watchdog timer
- 14 total interrupt sources with 6 external

### PACKAGE OUTLINE



### DESCRIPTION

The DS87C530/DS83C530 is an 8051 compatible microcontroller based on the Dallas High Speed core. It uses four clocks per instruction cycle instead of 12 used by the standard 8051. It also provides a unique mix of peripherals not widely available on other processors. They include an on-chip Real Time Clock (RTC) and battery back up support for an on-chip 1K x 8 SRAM. The new Power Management Mode allows software to select reduced power operation while still processing.

# DALLAS SEMICONDUCTOR

## DS87C550 EPROM High-Speed Micro with A/D and PWM

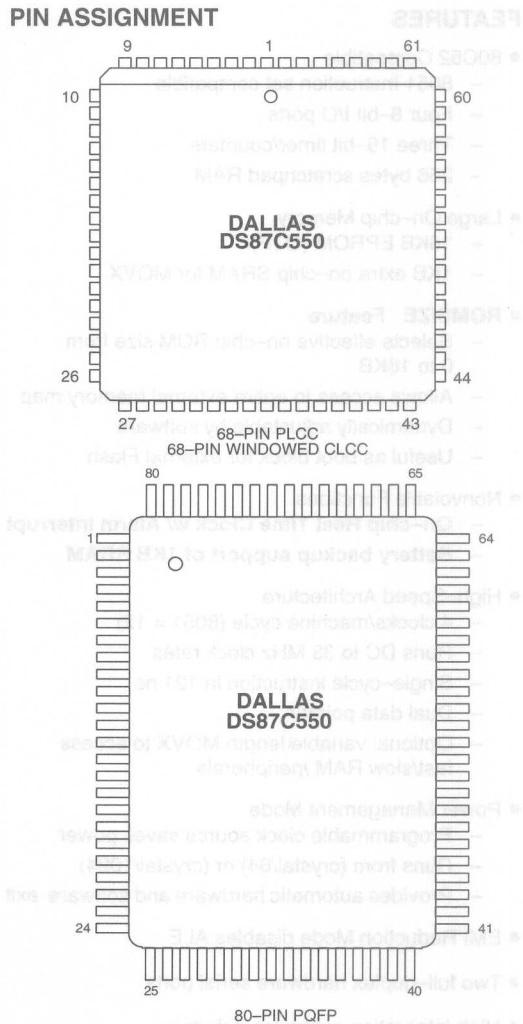
### FEATURES

- 87C52 Compatible
  - 8051-pin and instruction set compatible
  - Three 16-bit timer/counters
  - 256 bytes scratchpad RAM
- On-chip Memory
  - 8K bytes EPROM (OTP & Windowed Packages)
  - 1K byte extra on-chip SRAM for MOVX access
- On-chip Analog to Digital Converter
  - Eight channels of analog input, 10-bit resolution
  - Fast conversion time
  - Selectable internal or external reference voltage
- Pulse Width Modulator Outputs
  - Four channels of 8-bit PWM
  - Channels cascadable to 16-bit PWM
- 55 I/O Pins
- New Dual Data Pointer Operation
  - Either data pointer can be incremented or decremented
- ROMSIZE Feature
  - Selects effective on-chip ROM size from 0 to 8K
  - Allows access to entire external memory map
  - Dynamically adjustable by software
- High-Speed Architecture
  - 4 clocks/machine cycle (8051 = 12)
  - Runs DC to 33 MHz clock rates
  - Single-cycle instruction in 121 ns
  - New Stretch Cycle feature allows access to fast/slow memory or peripherals
- Unique Power Savings Modes
- EMI Reduction Mode disables ALE when not needed
- High integration controller includes:
  - Power-fail reset
  - Early-warning power-fail interrupt
  - Two full-duplex hardware serial ports
  - Programmable Watchdog timer
- 16 total interrupt sources with 6 external
- Available in 68-pin PLCC, 80-pin PQFP, and 68-pin windowed CLCC

### DESCRIPTION

The DS87C550 is a member of the fastest 100% 8051 compatible microcontroller family available. It features a redesigned processor core that removes wasted clock and memory cycles. As a result, it executes 8051

### PIN ASSIGNMENT



instructions up to 3 times faster than the original architecture for the same crystal speed. The DS87C550 also offers a maximum crystal speed of 33 MHz, resulting in apparent execution speeds of up to 99 MHz.

# DALLAS SEMICONDUCTOR

**DS2250(T)**  
Soft Microcontroller Module

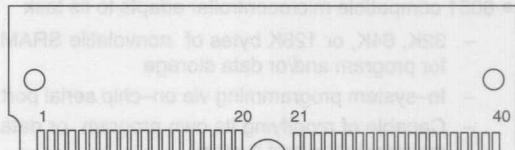
## FEATURES

- 8-bit 8051-compatible microcontroller adapts to task at hand:
    - 8K, 32K, or 64K bytes of nonvolatile RAM for program and/or data memory storage
    - Initial downloading of software in end system via on-chip serial port
    - Capable of modifying its own program and/or data memory in end use
  - High-reliability operation:
    - Maintains all nonvolatile resources for 10 years in the absence of  $V_{CC}$
    - Power-fail reset
    - Early warning power-fail interrupt
    - Watchdog timer
  - Software Security Feature:
    - Executes encrypted software to prevent unauthorized disclosure
  - On-chip, full-duplex serial I/O ports
  - Two on-chip timer/event counters
  - 32 parallel I/O lines
  - Compatible with industry standard 8051 instruction set
  - Permanently powered real time clock

## **DESCRIPTION**

The DS2250(T) Soft Microcontroller Module is a fully 8051-compatible 8-bit CMOS microcontroller that offers "softness" in all aspects of its application. This is accomplished through the comprehensive use of nonvolatile technology to preserve all information in the absence of system  $V_{CC}$ . The internal program/data memory space is implemented using 8K, 32K, or 64K bytes of nonvolatile CMOS SRAM. Furthermore, inter-

## PIN ASSIGNMENT



#### 40-PIN SIMM

nal data registers and key configuration registers are also nonvolatile. An optional real time clock gives permanently powered timekeeping. The clock keeps time to a hundredth of a second using an on-board crystal. All nonvolatile memory and resources are maintained for over 10 years at room temperature in the absence of power.

**DALLAS**  
SEMICONDUCTOR

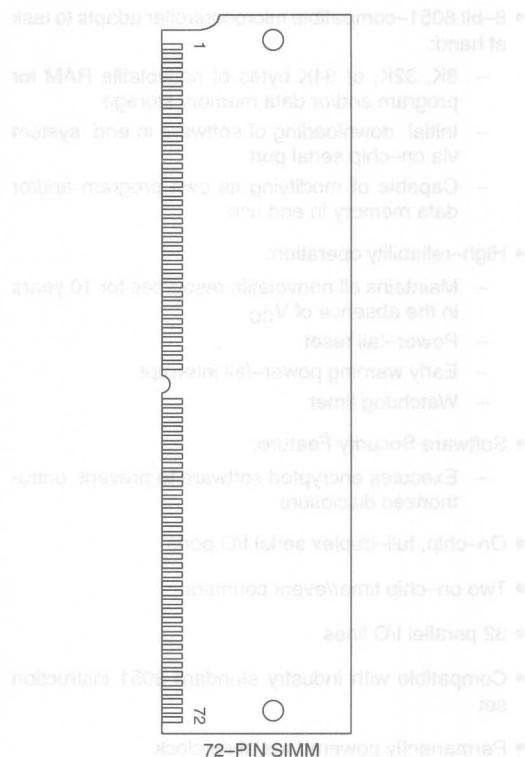
**DS2251T**  
128K Soft Microcontroller Module

### FEATURES

- 8051 compatible microcontroller adapts to its task
  - 32K, 64K, or 128K bytes of nonvolatile SRAM for program and/or data storage
  - In-system programming via on-chip serial port
  - Capable of modifying its own program or data memory in the end system
  - Provides separate byte-wide bus for peripherals
  - Performs CRC-16 check of NV RAM memory
- High-reliability operation
  - Maintains all nonvolatile resources for over 10 years in the absence of power
  - Power-fail reset
  - Early warning power-fail interrupt
  - Watchdog Timer
  - Lithium backed memory remembers system state
  - Precision reference for power monitor
- Fully 8051-compatible
  - 128 bytes scratchpad RAM
  - Two timer/counters
  - On-chip serial port
  - 32 parallel I/O port pins
- Permanently powered real time clock

### THEMIDIAKA M

### PACKAGE OUTLINE



### DESCRIPTION

The DS2251T is an 8051-compatible microcontroller module based on nonvolatile RAM technology. It is designed for systems that need large quantities of non-volatile memory. Like other members of the Secure Microcontroller family, it provides full compatibility with the 8051 instruction set, timers, serial port, and parallel I/O ports. By using NV RAM instead of ROM, the user can program, then reprogram the microcontroller while in-system. The application software can even change its own operation. This allows frequent software upgrades, adaptive programs, customized systems, etc. In addition, by using NV RAM, the DS2251T is ideal

for data logging applications. The powerful real time clock includes interrupts for time stamp and date. It keeps time to one-hundredths of seconds using its on-board 32 kHz crystal.

The DS2251T provides the benefits of NV RAM without using I/O resources. Between 32K bytes and 128K bytes of on-board NV RAM are available. A non-multiplexed byte-wide address and data bus is used for memory access.

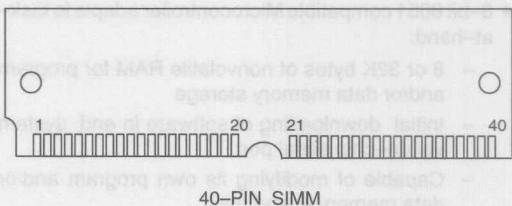
**DALLAS**  
SEMICONDUCTOR

## DS2252T Secure Microcontroller Module

### FEATURES

- 8051-compatible microcontroller for secure/sensitive applications
  - 32K, 64K, or 128K bytes of nonvolatile SRAM for program and/or data storage
  - In-system programming via on-chip serial port
  - Capable of modifying its own program or data memory in the end system
- Firmware Security Features:
  - Memory stored in encrypted form
  - Encryption using on-chip 64-bit key
  - Automatic true random key generator
  - SDI Self-destruct Input
  - Improved security over previous generations
  - Protects memory contents from piracy
- Crashproof Operation
  - Maintains all nonvolatile resources for over 10 years in the absence of power
  - Power-fail Reset
  - Early Warning Power-fail Interrupt
  - Watchdog Timer
  - Precision reference for power monitor
- Fully 8051-Compatible
  - 128 bytes scratchpad RAM
  - Two timer/counters
  - On-chip serial port
  - 32 parallel I/O port pins
- Permanently powered real time clock

### PACKAGE OUTLINE



### DESCRIPTION

The DS2252T is an 8051-compatible microcontroller based on nonvolatile RAM technology. It is designed for systems that need to protect memory contents from disclosure. This includes key data, sensitive algorithms, and proprietary information of all types. Like other members of the Secure Microcontroller family, it provides full compatibility with the 8051 instruction set, timers, serial port, and parallel I/O ports. By using NV RAM instead of ROM, the user can program, then reprogram the microcontroller while in-system. This allows frequent changing of sensitive processes with minimal effort. The DS2252T provides an array of mechanisms to prevent an attacker from examining the memory. It is designed to resist all levels of threat including observation, analysis, and physical attack. As a result, a massive effort would be required to obtain any information about memory contents. Furthermore, the "Soft" nature of the DS2252T allows frequent modification of secure information. This minimizes the value of any information that is obtained.



## DS5000(T) Soft Microcontroller Module

### FEATURES

- 8-bit 8051 compatible Microcontroller adapts to task-at-hand:
  - 8 or 32K bytes of nonvolatile RAM for program and/or data memory storage
  - Initial downloading of software in end system via on-chip serial port
  - Capable of modifying its own program and/or data memory in end use
- Crashproof operation:
  - Maintains all nonvolatile resources for 10 years in the absence of V<sub>CC</sub>
  - Power-fail reset
  - Early warning power-fail interrupt
  - Watchdog timer
- Software Security Feature:
  - Executes encrypted software to prevent unauthorized disclosure
- On-chip, full-duplex serial I/O ports
- Two on-chip timer/event counters
- 32 parallel I/O lines
- Compatible with industry standard 8051 instruction set and pinout
- Optional Permanently Powered Real-Time Clock (DS5000T)

### DESCRIPTION

The DS5000(T) Soft Microcontroller Module is a fully 8051 compatible 8-bit CMOS microcontroller that offers "softness" in all aspects of its application. This is accomplished through the comprehensive use of nonvolatile technology to preserve all information in the absence of system V<sub>CC</sub>. The internal program/data memory space is implemented using either 8K or

### PIN ASSIGNMENT

	PIN NUMBER	FUNCTION
P1.0	1	40 V <sub>CC</sub>
P1.1	2	P0.0 AD0
P1.2	3	P0.1 AD1
P1.3	4	P0.2 AD2
P1.4	5	P0.3 AD3
P1.5	6	P0.4 AD4
P1.6	7	P0.5 AD5
P1.7	8	P0.6 AD6
RST	9	P0.7 AD7
RXD P3.0	10	EA
TXD P3.1	11	ALE
INT0 P3.2	12	PSEN
INT1 P3.3	13	P2.7 A15
TO P3.4	14	P2.6 A14
T1 P3.5	15	P2.5 A13
WR P3.6	16	P2.4 A12
RD P3.7	17	P2.3 A11
XTAL2	18	P2.2 A10
XTAL1	19	P2.1 A9
GND	20	P2.0 A8

### 40-PIN ENCAPSULATED PACKAGE

32K bytes of nonvolatile CMOS SRAM. Furthermore, internal data registers and key configuration registers are also nonvolatile. An optional real time clock gives permanently powered timekeeping. The clock keeps time to a hundredth of a second using an on-board crystal.

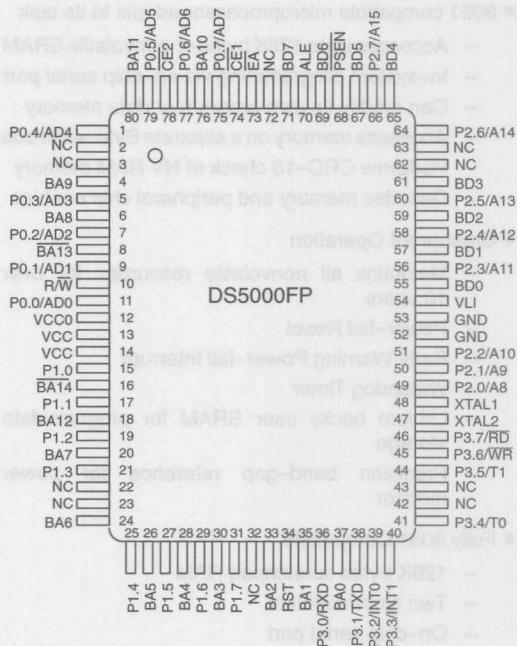
# DALLAS SEMICONDUCTOR

## **DS5000FP**

FEATURES

- 8051 compatible microprocessor adapts to its task
    - Accesses between 8K and 64K bytes of nonvolatile SRAM
    - In-system programming via on-chip serial port
    - Can modify its own program or data memory
    - Accesses memory on a separate Byte-wide bus
  - Crashproof Operation
    - Maintains all nonvolatile resources for over 10 years
    - Power-fail Reset
    - Early Warning Power-fail Interrupt
    - Watchdog Timer
    - User supplied Lithium battery backs user SRAM for program/data storage
  - Software Security
    - Executes encrypted programs to prevent observation
    - Security Lock prevents download
    - Unlocking destroys contents
  - Fully 8051 Compatible
    - 128 bytes scratchpad RAM
    - Two timer/counters
    - On-chip serial port
    - 32 parallel I/O port pins

## PIN ASSIGNMENT



### **DESCRIPTION**

The DS5000FP is an 8051 compatible processor based on nonvolatile RAM technology. It is substantially more flexible than a standard 8051, yet provides full compatibility with the 8051 instruction set, timers, serial port, and parallel I/O ports. By using NV RAM instead of ROM, the user can program, then reprogram the microcontroller while in-system. The application software can even change its own operation. This allows frequent software upgrades, adaptive programs, customized systems, etc. In addition, by using NV SRAM, the DS5000FP is ideal for data logging applications. It con-

ncts easily to a Dallas Real Time Clock for time stamp and date.

The DS5000FP provides the benefits of NV RAM without using I/O resources. It uses a non-multiplexed Byte-wide address and data bus for memory access. This bus can perform all memory access and provides decoded chip enables for SRAM. This leaves the 32 I/O port pins free for application use. The DS5000FP uses ordinary SRAM and battery backs the memory contents with a user's external lithium cell.



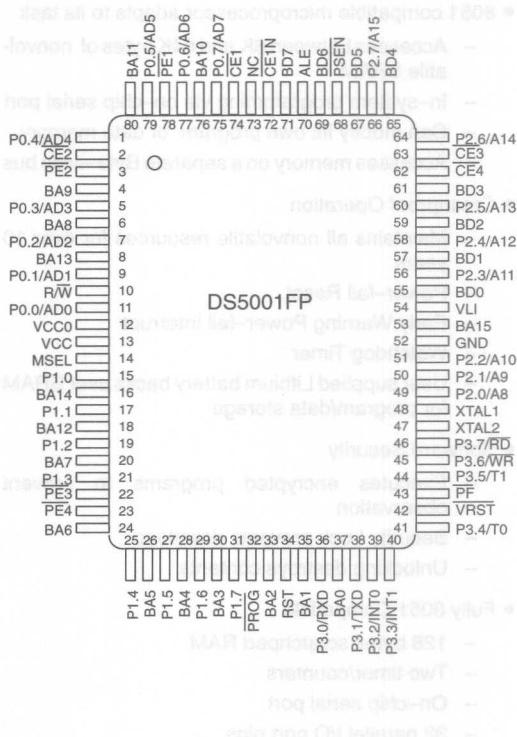
# DS5001FP

## 128K Soft Microprocessor Chip

### FEATURES

- 8051 compatible microprocessor adapts to its task
  - Accesses up to 128K bytes of nonvolatile SRAM
  - In-system programming via on-chip serial port
  - Can modify its own program or data memory
  - Accesses memory on a separate Byte-wide bus
  - Performs CRC-16 check of NV RAM memory
  - Decodes memory and peripheral chip enables
- Crashproof Operation
  - Maintains all nonvolatile resources for over 10 years
  - Power-fail Reset
  - Early Warning Power-fail Interrupt
  - Watchdog Timer
  - Lithium backs user SRAM for program/data storage
  - Precision band-gap reference for power monitor
- Fully 8051 Compatible
  - 128K bytes scratchpad RAM
  - Two timer/counters
  - On-chip serial port
  - 32 parallel I/O port pins
- Software Security Available with DS5002FP Secure Microprocessor

### PIN ASSIGNMENT



### DESCRIPTION

The DS5001FP is an 8051 compatible microprocessor based on nonvolatile RAM technology. It is designed for systems that need large quantities of nonvolatile memory. Like its predecessor the DS5000(T), the DS5001FP is substantially more flexible than a standard 8051. It provides full compatibility with the 8051 instruction set, timers, serial port, and parallel I/O ports. By using NV RAM instead of ROM, the user can pro-

gram, then reprogram the microprocessor while in-system. The application software can even change its own operation. This allows frequent software upgrades, adaptive programs, customized systems, etc. In addition, by using NV SRAM, the DS5001FP is ideal for data logging applications. It also connects easily to a Dallas Real Time Clock for time stamp and date.

**DALLAS**  
SEMICONDUCTOR

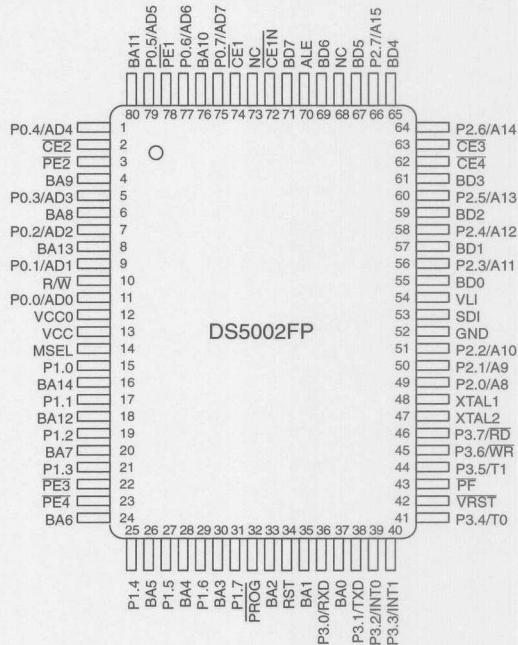
## DS5002FP

### Secure Microprocessor Chip

#### FEATURES

- 8051 compatible microprocessor for secure/sensitive applications
  - Access 32K, 64K, or 128K bytes of nonvolatile SRAM for program and/or data storage
  - In-system programming via on-chip serial port
  - Capable of modifying its own program or data memory in the end system
- Firmware Security Features:
  - Memory stored in encrypted form
  - Encryption using on-chip 64-bit key
  - Automatic true random key generator
  - SDI Self Destruct Input
  - Optional top coating prevents microprobe (DS5002FPM)
  - Improved security over previous generations
  - Protects memory contents from piracy
- Crashproof Operation
  - Maintains all nonvolatile resources for over 10 years in the absence of power
  - Power-fail Reset
  - Early Warning Power-fail Interrupt
  - Watchdog Timer

#### PIN ASSIGNMENT



#### DESCRIPTION

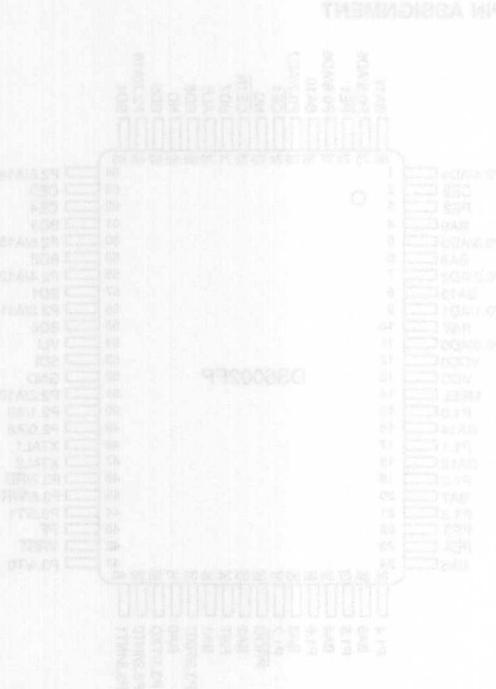
The DS5002FP Secure Microprocessor Chip is a secure version of the DS5001FP 128K Soft Microprocessor Chip. In addition to the memory and I/O enhancements of the DS5001FP, the Secure Microprocessor Chip incorporates the most sophisticated security features available in any processor. The security features of the DS5002FP include an array of mechanisms which are designed to resist all levels of threat, including observation, analysis, and physical attack. As a result, a massive effort would be required to obtain any information about memory contents. Furthermore, the "soft" nature of the DS5002FP allows frequent modification of the secure information, thereby minimizing the value of

any secure information obtained by such a massive effort.

The DS5002FP implements a security system which is an improved version of its predecessor, the DS5000FP. Like the DS5000FP, the DS5002FP loads and executes application software in encrypted form. Up to 128K x 8 bytes of standard SRAM can be accessed via its Byte-wide bus. This RAM is converted by the DS5002FP into lithium-backed nonvolatile storage for program and data. Data is maintained for over 10 years at room temperature with a very small lithium cell.

## SecuTe Microblot Processor Chip

**DATA**  
TECHNOLOGY



The DS200SFB SecuTe Microblot Processor Chip is a high-throughput, automated system designed for the rapid analysis of multiple samples. It features a built-in barcode reader and a color touch screen display for easy sample identification and results viewing. The chip itself contains 1536 individual microspots, each capable of holding up to 150 μl of liquid. The system can process up to 100 samples per hour, making it ideal for applications such as protein profiling, metabolite analysis, and drug screening. The DS200SFB SecuTe Microblot Processor Chip is a reliable and efficient tool for researchers looking to streamline their workflow and increase productivity.

- **VERSATILE**
  - 96/144/288/384/496/640/768/960/1152/1344/1536 individual microblots for fast screening assays
  - Accurate 350 μm or 1250 μm pitch of junctions
  - RAM for reading results via on-chip sensor
  - 16-channel blotting board fits our 1280 plate
  - Capable of reading and reusing the same well without loss of signal integrity
- **EFFICIENT**
  - Minimizes bench time required for blotting
  - Elimination of rinsing and reagent handling
  - Automates protein loading and blotting
  - Simplifies blotting from 1280 plate
  - Provides uniform protein distribution
  - Protein loading sequence from blank
- **CONVENIENT OPERATION**
  - Minimizes all handling time for over 10 years in life sciences
  - Power-on self test
  - Easy Microplate power-on via USB
  - Multi-step Timer

**DESCRIPTION**  
The DS200SFB SecuTe Microblot Processor Chip is a 1536 array version of the DS200TFSR 1536 Spot Microblotting System. It is designed for use with the DS200TFSR blotting board. This microblotter uses the same technology as the DS200TFSR, but with a much smaller footprint. The DS200SFB is able to hold up to 150 μl of liquid in each spot, making it ideal for protein profiling and metabolite analysis. The DS200SFB is also able to read barcodes on the blotting board, which makes it easy to identify samples. The DS200SFB is a reliable and efficient tool for researchers looking to streamline their workflow and increase productivity.

## NONVOLATILE CONTROLLERS

**DALLAS**  
SEMICONDUCTOR

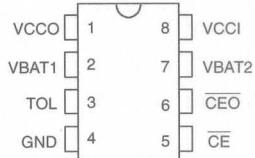
# DS1210

## Nonvolatile Controller Chip

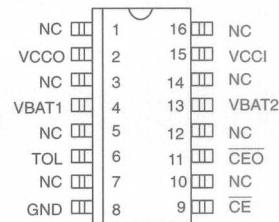
### FEATURES

- Converts CMOS RAMs into nonvolatile memories
- Unconditionally write protects when  $V_{CC}$  is out of tolerance
- Automatically switches to battery when power fail occurs
- Space saving 8-pin DIP
- Consumes less than 100 nA of battery current
- Tests battery condition on power up
- Provides for redundant batteries
- Optional 5% or 10% power fail detection
- Low forward voltage drop on the  $V_{CC}$  switch
- Optional 16-pin SOIC surface mount package
- Optional industrial temperature range of -40°C to +85°C.

### PIN ASSIGNMENT



DS1210 8-Pin DIP (300 MIL)  
See Mech. Drawings Section



DS1210S 16-Pin SOIC (300 MIL)  
See Mech. Drawings Section

### PIN DESCRIPTION

$V_{CCO}$	- RAM Supply
$V_{BAT1}$	- + Battery 1
TOL	- Power Supply Tolerance
GND	- Ground
$\overline{CE}$	- Chip Enable Input
$\overline{CEO}$	- Chip Enable Output
$V_{BAT2}$	- + Battery 2
$V_{CCI}$	- + Supply
NC	- No Connect

### DESCRIPTION

The DS1210 Nonvolatile Controller Chip is a CMOS circuit which solves the application problem of converting CMOS RAM into nonvolatile memory. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, chip enable is inhibited to accomplish write protection and the battery is switched on to supply the RAM with uninterrupted power. Special

circuitry uses a low-leakage CMOS process which affords precise voltage detection at extremely low battery consumption. The 8-pin DIP package keeps PC board real estate requirements to a minimum. By combining the DS1210 Nonvolatile Controller Chip with a CMOS memory and batteries, nonvolatile RAM operation can be achieved.

**DALLAS**  
SEMICONDUCTOR

# DS1211 Nonvolatile Controller x 8 Chip

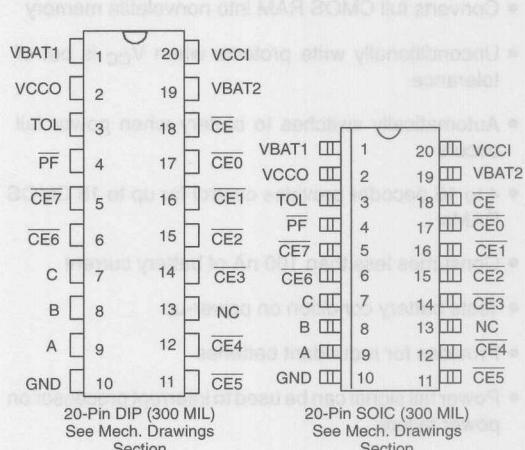
## FEATURES

- Converts full CMOS RAMs into nonvolatile memories
- Unconditionally write protects when  $V_{CC}$  is out of tolerance
- Automatically switches to battery when power fail occurs
- 3 to 8 decoder provides control for up to eight CMOS RAMs
- Consumes less than 100 nA of battery current
- Tests battery condition on power-up
- Provides for redundant batteries
- Power fail signal can be used to interrupt processor on power failure
- Optional 5% or 10% power fail detection
- Optional 20-pin SOIC surface mount package
- Optional industrial temperature range of -40°C to +85°C

## DESCRIPTION

The DS1211 Nonvolatile Controller x 8 Chip is a CMOS circuit which solves the application problem of converting CMOS RAMs into nonvolatile memories. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, the chip enables are inhibited to accomplish write protection and the battery is switched on to supply RAMs with uninterrupted power. Special circuitry uses a low-leakage CMOS process

## PIN ASSIGNMENT



## PIN DESCRIPTION

A, B, C	- Address Inputs
CE	- Chip Enable Input
CE0 - CE7	- Chip Enable Outputs
GND	- Ground
$V_{BAT1}$	- + Battery 1
$V_{BAT2}$	- + Battery 2
TOL	- Power Supply Tolerance
$V_{CCI}$	- +5V Supply
$V_{CCO}$	- RAM Supply
PF	- Power Fail
NC	- No Connection

which affords precise voltage detection at extremely low battery consumption.

By combining the DS1211 nonvolatile controller/decoder chip and lithium batteries, nonvolatile RAM operation can be achieved for up to eight CMOS memories.

See the data sheet for the DS1212 Nonvolatile Controller x 16 Chip for electrical specifications and operation.

**DALLAS**  
SEMICONDUCTOR

**DS1212**  
Nonvolatile Controller x 16 Chip

## FEATURES

- Converts full CMOS RAM into nonvolatile memory
- Unconditionally write protects when V<sub>CC</sub> is out of tolerance
- Automatically switches to battery when power fail occurs
- 4 to 16 decoder provides control for up to 16 CMOS RAMs
- Consumes less than 100 nA of battery current
- Tests battery condition on power-up
- Provides for redundant batteries
- Power fail signal can be used to interrupt processor on power failure
- Optional 5% or 10% power fail detection
- Optional 28-pin PLCC surface mount package
- Optional industrial temperature range of -40°C to +85°C

## DESCRIPTION

The DS1212 Nonvolatile Controller x16 Chip is a CMOS circuit that solves the application problem of converting CMOS RAMs into nonvolatile memories. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, the chip enables are inhibited to accomplish write protection and the battery is switched on to supply the RAMs with uninterrupted power. Special circuitry uses a low-leakage CMOS process that affords precise voltage detection at extremely low battery consumption.

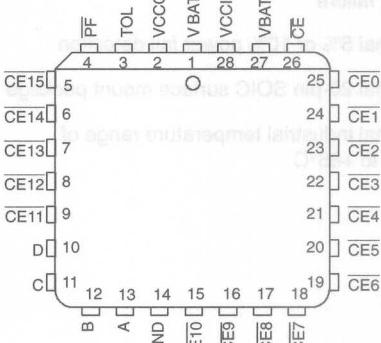
By combining the DS1212 Nonvolatile Controller chip and lithium batteries, nonvolatile RAM operation can be achieved for up to 16 CMOS memories.

## PIN ASSIGNMENT

VBAT1	1	28	VCCI
VCCO	2	27	VBAT2
TOL	3	26	CE
PF	4	25	CE0
CE15	5	24	CE1
CE14	6	23	CE2
CE13	7	22	CE3
CE12	8	21	CE4
CE11	9	20	CE5
D	10	19	CE6
C	11	18	CE7
B	12	17	CE8
A	13	16	CE9
GND	14	15	CE10

28-Pin DIP (600 MIL)

See Mech. Drawings Section



28-Pin PLCC

See Mech. Drawings Section

## PIN DESCRIPTION

A, B, C, D	- Address Inputs
CE	- Chip Enable
CE0-CE15	- Chip Enable Outputs
GND	- Ground
VBAT1	- + Battery 1
VBAT2	- + Battery 2
TOL	- Power Supply Tolerance
VCCI	- +5V Supply
VCCO	- RAM Supply
PF	- Power Fail

**DALLAS**  
SEMICONDUCTOR

**DS1218**  
Nonvolatile Controller

### FEATURES

- Converts CMOS RAM into nonvolatile memories
- Unconditionally write protects when  $V_{CC}$  is out of tolerance
- Automatically switches to battery when power fail occurs
- Space saving 8-pin mini-DIP/8-pin 150 mil SOIC
- Consumes less than 100 nA of battery current

### DESCRIPTION

The DS1218 is a CMOS circuit which solves the application problems of converting CMOS RAM into nonvolatile memory. Incoming power is monitored for an out of tolerance condition. When such a condition is detected, the chip enable output is inhibited to accomplish write protection and the battery is switched on to supply RAM with uninterrupted power. Special circuitry uses a low-leakage CMOS process which affords precise voltage detection at extremely low battery consumption. The 8-pin mini-DIP package keeps PC board real estate requirements to a minimum. By combining the DS1218 nonvolatile controller chip with a full CMOS memory and lithium batteries, ten years of nonvolatile RAM operation can be achieved.

### OPERATION

The DS1218 Nonvolatile Controller performs the circuit functions required to battery back up a RAM. First, a

### PIN ASSIGNMENT



### PIN DESCRIPTION

$V_{CCO}$	- Input +5 Volt Supply
$V_{CCO}$	- RAM Power ( $V_{CC}$ ) Supply
CEI	- Chip Enable Input
NC	- No Connection
CEO	- Chip Enable Output
$V_{BAT}$	- + Battery
GND	- Ground

switch is provided to direct power from the battery or  $V_{CCI}$  supply depending on which is greater. This switch has a voltage drop of less than 0.2V. The second function which the nonvolatile controller provides is power fail detection. The DS1218 constantly monitors the  $V_{CC}$  supply. When  $V_{CCI}$  falls to 1.26 times the battery voltage a precision comparator outputs a power fail detect signal to the chip enable logic. The third function of write protection is accomplished by holding the chip enable output signal to within 0.2V of the  $V_{CCI}$  or battery supply, when a power fail condition is detected.

During nominal supply conditions, the chip enable output will follow chip enable input with a maximum propagation delay of 10 ns.

# DALLAS SEMICONDUCTOR

**DS1221**  
Nonvolatile Controller x 4 Chip

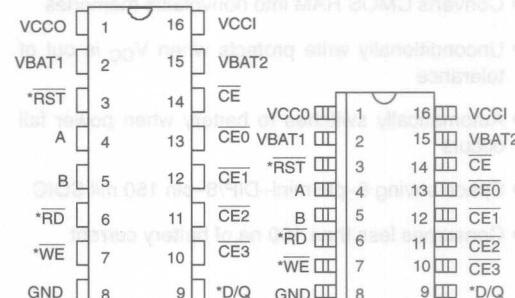
## FEATURES

- Converts CMOS RAMs into nonvolatile memories
  - Data is automatically protected during power loss
  - 2-to-4 decoder provides for up to 4 CMOS RAMs
  - Provides for redundant batteries
  - Test battery condition on power-up
  - Full  $\pm 10\%$  operating range
  - Unauthorized access can be prevented with optional security feature
  - 16-pin 0.3-inch DIP saves PC board space
  - Optional 16-pin SOIC surface mount package
  - Optional industrial temperature range of -40°C to +85°C available

## **DESCRIPTION**

The DS1221 Nonvolatile Controller x 4 Chip is a CMOS circuit which solves the application problem of converting CMOS RAMs into nonvolatile memories. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, the chip enable outputs are inhibited to accomplish write protection and the battery is switched on to supply RAMs with uninterrupted power. An optional security code prevents unau-

## PIN ASSIGNMENT



DS1221 16-Pin DIP (300 MIL)  
See Mech. Drawings

DS1221 16-Pin SOIC (300 MIL)  
See Mech. Drawings  
Section

## PIN DESCRIPTION

A, B	- Address Inputs
<u>CE</u>	- Chip Enable Input
<u>CE0</u> - <u>CE3</u>	- Chip Enable Outputs
V <sub>BAT1</sub>	- + Battery 1
V <sub>BAT2</sub>	- + Battery 2
<u>*RST</u>	- Reset
V <sub>CCI</sub>	- +5V Supply
V <sub>CCO</sub>	- RAM Supply
<u>*RD</u>	- Read Input
<u>*WE</u>	- Write Input
<u>*D/Q</u>	- Data Input/Output

\*Used with optional security circuit only and must be connected to ground in all other cases.

thorized users from obtaining access to the memory space. The nonvolatile controller/decoder circuitry uses a low-leakage CMOS process which affords precise voltage detection at extremely low battery consumption. By combining the DS1221 with up to four CMOS memories and lithium batteries, nonvolatile operation can be achieved.

**DALLAS**  
SEMICONDUCTOR

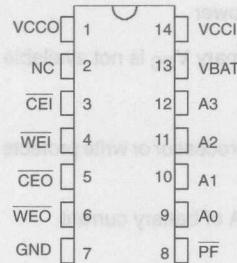
# DS1234

## Conditional Nonvolatile Controller Chip

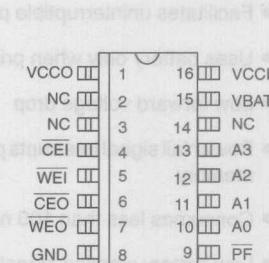
### FEATURES

- Converts CMOS static RAMs into nonvolatile memories
- Software-controlled write inhibit
- Software-controlled battery disconnect extends battery life
- Unconditionally write protects when V<sub>CC</sub> is out of tolerance
- Consumes less than 100 nA of battery current
- Power fail signal can be used to interrupt processor on power failure
- Low forward voltage drop on the V<sub>CC</sub> switch
- Optional 16-pin SOIC surface mount package

### PIN ASSIGNMENT



DS1234 14-Pin DIP (300 MIL)  
See Mech. Drawings  
Section



DS1234S 16-Pin SOIC (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

V <sub>CCO</sub>	- RAM Supply
NC	- No Connection
CEI	- Chip Enable Input
WEI	- Write Enable Input
CEO	- Chip Enable Output to RAM
WEO	- Write Enable Output to RAM
GND	- Ground
PF	- Power Fail Output
A <sub>0</sub> -A <sub>3</sub>	- Address Inputs
V <sub>BAT</sub>	- Battery Input
V <sub>CCI</sub>	- +5V Supply

### DESCRIPTION

The DS1234 is a CMOS circuit that converts CMOS RAM into nonvolatile memory and adds two software selectable switches. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, chip enable and write enable to the RAM are inhibited to accomplish write protection, and the battery is switched on to supply the memory with uninterrupted power. The two software selectable switches provided by the DS1234 are capable of inhibiting both the write

enable to the RAM and the battery backup circuitry by a pattern recognition sequence across four address lines. Inhibiting the write enable to the nonvolatile RAM provides data integrity by isolating the memory contents from external change. The second switch provides added flexibility and increases battery life to the system by enabling/disabling the battery for shipment or storage, or when battery backup is not needed.

**DALLAS**  
SEMICONDUCTOR

**DS1259**  
Battery Manager Chip

## FEATURES

- Facilitates uninterruptible power
- Uses battery only when primary  $V_{CC}$  is not available
- Low forward voltage drop
- Power fail signal interrupts processor or write protects memory
- Consumes less than 100 nA of battery current
- Low battery warning signal
- Battery can be electrically disconnected upon command
- Battery will automatically reconnect when  $V_{CC}$  is applied
- Mates directly with DS1212 Nonvolatile Controller x 16 Chip to back up 16 RAMs
- Optional 16-pin SOIC surface mount package

## DESCRIPTION

The DS1259 Battery Manager Chip is a low-cost battery management system for portable and nonvolatile electronic equipment. A battery connected to the battery input pin supplies power to CMOS electronic circuits when primary power is lost through an efficient switch via the  $V_{CCO}$  pins. When power is supplied from the bat-

## PIN ASSIGNMENT

NC	1	16	VCCI	NC	1	16	VCCI
VBAT	2	15	VCCI	VBAT	2	15	VCCI
BF	3	14	NC	BF	3	14	NC
NC	4	13	VCCO	NC	4	13	VCCO
BAT	5	12	VCCO	BAT	5	12	VCCO
RST	6	11	PF	RST	6	11	PF
GND	7	10	NC	GND	7	10	NC
GND	8	9	NC	GND	8	9	NC

16-Pin DIP Package  
(300 MIL)  
See Mech. Drawings  
Section

16-Pin SOIC Package  
(300 MIL)  
See Mech. Drawings  
Section

## PIN DESCRIPTION

NC	— No Connection
$V_{BAT}$	— Battery Input Connection
BF	— Battery Fail Output Signal
BAT	— Battery Output
RST	— Reset Input
GND	— Ground
PF	— Power Fail Output Signal
$V_{CCO}$	— RAM Supply
$V_{CCI}$	— +5V Supply

**DALLAS**  
SEMICONDUCTOR

**DS1260**  
Smart Battery

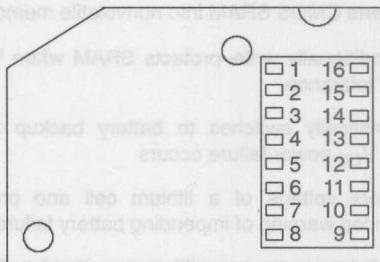
## FEATURES

- Encapsulated lithium energy cell with shelf life beyond 10 years
- Available with energy capacities of 250, 500, and 1,000 mAh @ 3 volts
- Plugs into a standard 16-pin DIP socket
- Lithium cell electrically disconnects from exposed pins upon command
- Battery isolation ensures full capacity after shipping and handling
- Lithium cell automatically reconnects when V<sub>CC</sub> is applied
- Recessed pins prevent bending
- V<sub>CC</sub> fail signal interrupts processor or write protects memory
- Exhausted energy cell warning signal
- Low profile permits mounting on 0.5-inch printed circuit board centers
- Mates directly with DS1212 Nonvolatile Controller to back up 16 SRAMs
- Uninterruptible supply for CMOS and portable devices

## DESCRIPTION

The DS1260 SmartBattery is a low-cost, backup energy supply for portable and nonvolatile electronic equipment. A lithium energy source of up to 1 amp hour can supply power to CMOS electronic circuits when primary power is lost through an intelligent and efficient switch. When power is supplied from the lithium power source, the power fail signal is held low to warn electronic

## PIN ASSIGNMENT



See Mech. Drawings  
Section

## PIN DESCRIPTION

Pins 1, 2, 4, 7, 9, 10, and 14 are No-Connects  
Pin 3 is Battery Fail ( $\overline{BF}$ )  
Pin 5 is Battery Out (BAT)  
Pin 6 is RESET (RST) Input  
Pin 8 is Ground  
Pin 11 is Power Fail ( $\overline{PF}$ )  
Pins 12 and 13 are RAM Supply (V<sub>CCO</sub>)  
Pins 15 and 16 are +5V Supply (V<sub>CC</sub>)

## DESCRIPTION

The DS1260 SmartBattery is a low-cost, backup energy supply for portable and nonvolatile electronic equipment. A lithium energy source of up to 1 amp hour can supply power to CMOS electronic circuits when primary power is lost through an intelligent and efficient switch. When power is supplied from the lithium power source, the power fail signal is held low to warn electronic (RESET) circuits of the power status. Energy loss during shipping and handling is avoided by pulsing RESET, thereby causing the backup energy source to be isolated from the exposed pins. The DS1260 can be plugged into a standard 16-pin, low-cost DIP socket, allowing for proven interconnect and simple replacement if the energy has been exhausted.

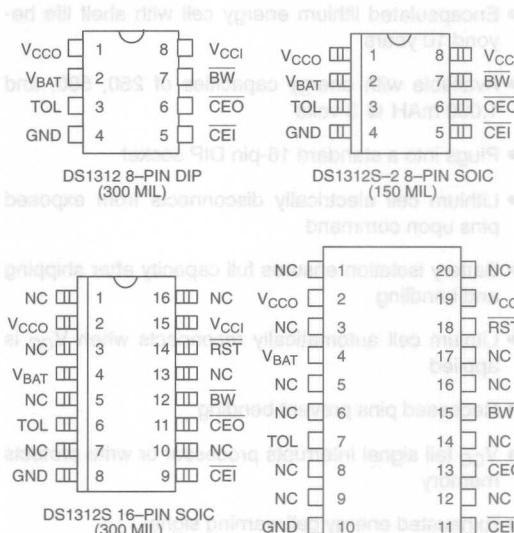
## FEATURES

- Converts CMOS SRAM into nonvolatile memory
- Unconditionally write-protects SRAM when  $V_{CC}$  is out of tolerance
- Automatically switches to battery backup supply when  $V_{CC}$  power failure occurs
- Monitors voltage of a lithium cell and provides advanced warning of impending battery failure
- Signals low-battery condition on active low Battery Warning output signal
- Optional -5% or -10% power fail detection
- Space-saving 8-pin DIP and SOIC packages
- Optional 16-pin SOIC and 20-pin TSSOP versions reset processor when power failure occurs and hold processor in reset during system power-up
- Industrial temperature range of -40°C to +85°C

## DESCRIPTION

The DS1312 Nonvolatile Controller with Battery Monitor is a CMOS circuit which solves the application problem of converting CMOS RAM into nonvolatile memory. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, chip enable is inhibited to accomplish write protection and the battery is switched on to supply the RAM with uninterrupted power. Special circuitry uses a low-leakage CMOS process which affords precise voltage detection at extremely low battery consumption.

## PIN ASSIGNMENT



## PIN DESCRIPTION

$V_{CCO}$	- +5V Power Supply Input
$V_{CCI}$	- SRAM Power Supply Output
$V_{BAT}$	- Backup Battery Input
CEI	- Chip Enable Input
CEO	- Chip Enable Output
TOL	- Vcc Tolerance Select
BW	- Battery Warning Output (Open Drain)
RST	- Reset Output (Open Drain)
GND	- Ground
NC	- No Connection

# DALLAS SEMICONDUCTOR

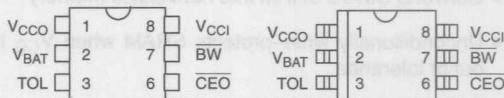
## **DS1314**

### 3V Nonvolatile Controller with Lithium Battery Monitor

## FEATURE

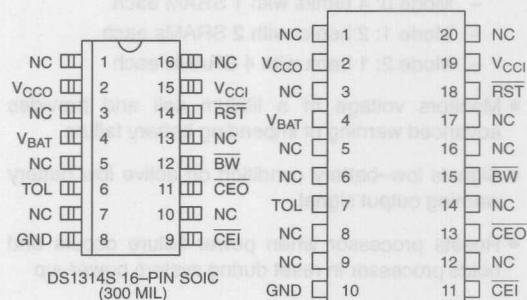
- Converts CMOS SRAM into nonvolatile memory
  - Unconditionally write-protects SRAM when  $V_{CC}$  is out of tolerance
  - Automatically switches to battery-backup supply when  $V_{CC}$  power failure occurs
  - Monitors voltage of a lithium cell and provides advanced warning of impending battery failure
  - Signals low-battery condition on active low Battery Warning output signal
  - Automatic  $V_{CC}$  power-fail detection for 3.0V or 3.3V power supplies
  - Space-saving 8-pin DIP and SOIC packages
  - Optional 16-pin SOIC and 20-pin TSSOP versions
  - reset processor when power failure occurs and hold processor in reset during system power-up
  - Industrial temperature range of  $-40^{\circ}C$  to  $+85^{\circ}C$ .

## PIN ASSIGNMENT



DS1314 8-PIN DIP  
(300 MIL.)

DS1314S-2 8-PIN SOIC  
(150 MIL.)



DS1314S 16-PIN SOIC  
(300 MIL.)

DS1314F 20-PIN TSSOP

## **DESCRIPTION**

The DS1314 Nonvolatile Controller with Battery Monitor is a CMOS circuit which solves the application problem of converting CMOS RAM into nonvolatile memory. Incoming power is monitored for an out-of-tolerance condition. When such a condition is detected, chip enable is inhibited to accomplish write protection and the battery is switched on to supply the RAM with uninterrupted power. Special circuitry uses a low-leakage CMOS process which affords precise voltage detection at extremely low battery consumption.

## PIN DESCRIPTION

$V_{CCI}$	- Power Supply Input
$V_{CCO}$	- SRAM Power Supply Output
$V_{BAT}$	- Backup Battery Input
$CEI$	- Chip Enable Input
$CEO$	- Chip Enable Output
$TOL$	- $V_{CC}$ Tolerance Select
$BW$	- Battery Warning Output (Open Drain)
$RST$	- Reset Output (Open Drain)
$GND$	- Ground
$NC$	- No Connection



# DS1321

## Flexible Nonvolatile Controller with Lithium Battery Monitor

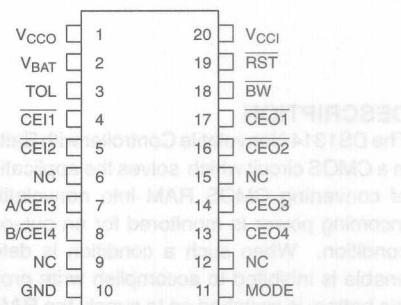
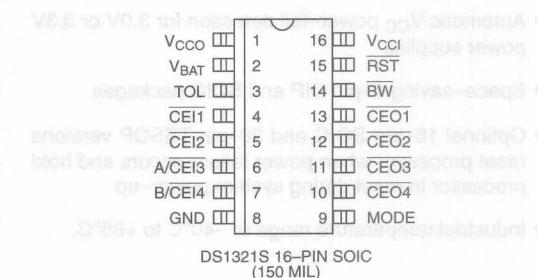
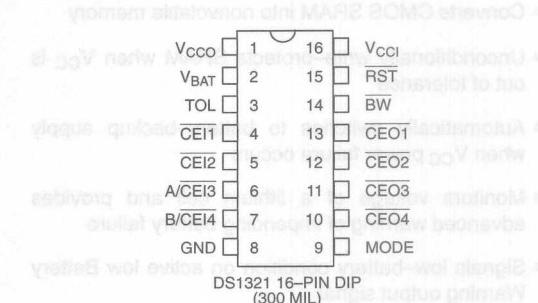
### FEATURES

- Converts CMOS SRAM into nonvolatile memory
- Unconditionally write-protects SRAM when  $V_{CC}$  is out of tolerance
- Automatically switches to battery backup supply when  $V_{CC}$  power failure occurs
- Flexible memory organization
  - Mode 0: 4 banks with 1 SRAM each
  - Mode 1: 2 banks with 2 SRAMs each
  - Mode 2: 1 bank with 4 SRAMs each
- Monitors voltage of a lithium cell and provides advanced warning of impending battery failure
- Signals low-battery condition on active low battery warning output signal
- Resets processor when power failure occurs and holds processor in reset during system power-up
- Optional –5% or –10% power fail detection
- 16-pin DIP, 16-pin SOIC and 20-pin TSSOP packages
- Industrial temperature range of –40°C to +85°C

### PIN DESCRIPTION

$V_{CCI}$	– +5V Power Supply Input
$V_{CCO}$	– SRAM Power Supply Output
$V_{BAT}$	– Backup Battery Input
A, B	– Address Inputs
$\overline{CEI1}$ – $\overline{CEI4}$	– Chip Enable Inputs
$\overline{CEO1}$ – $\overline{CEO4}$	– Chip Enable Outputs
TOL	– $V_{CC}$ Tolerance Select
BW	– Battery Warning Output (Open Drain)
$\overline{RST}$	– Reset Output (Open Drain)
MODE	– Mode Input
GND	– Ground
NC	– No Connection

### PIN ASSIGNMENT



# DALLAS SEMICONDUCTOR

## DS1610 Partitioned NV Controller

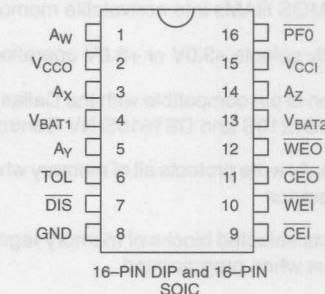
### FEATURES

- Converts CMOS RAMs into nonvolatile memories
- SOIC version is pin compatible with the Dallas Semiconductor DS1210 NV Controller
- Unconditionally write protects all of memory when  $V_{CC}$  is out of tolerance
- Write protects selected blocks of memory regardless of  $V_{CC}$  status when programmed
- Automatically switches to battery backup supply when power fail occurs
- Provides for multiple batteries
- Consumes less than 100 nA of battery current
- Test battery on power up by inhibiting the second memory cycle
- Optional 5% or 10% power-fail detection
- 16-pin DIP or 16-pin SOIC surface mount package
- Low forward voltage drop on the  $V_{CC}$  switch with currents of up to 150 mA
- Optional industrial temperature range of -40°C to +85°C

### DESCRIPTION

The DS1610 is a low power CMOS circuit which solves the application problems of converting CMOS RAMs into nonvolatile memories. In addition the device has the ability to unconditionally write protect blocks of memory so that inadvertent write cycles do not corrupt program and special data space. The power supply incoming voltage at the  $V_{CCI}$  input pin is constantly monitored for an out of tolerance condition. When such a condition is detected, both the chip-enable and write enable outputs are inhibited to protect stored data. The battery inputs are used to supply  $V_{CCO}$  with power when  $V_{CCI}$  is less than the battery input voltages. Special circuitry uses a low leakage CMOS process which affords

### PIN ASSIGNMENT



### PIN DESCRIPTION

$V_{CCI}$	- Input +5 Volt Supply
$V_{BAT1}$	- + Battery 1 Input
$V_{BAT2}$	- + Battery 2 Input
$V_{CCO}$	- RAM Power ( $V_{CC}$ ) Supply
GND	- Ground
CEI	- Chip Enable Input
CEO	- Chip Enable Output
WEI	- Write Enable Input
WEO	- Write Enable Output
TOL	- Power Supply Tolerance Select
A <sub>W</sub> - A <sub>Z</sub>	- Address Inputs
DIS	- Memory Partition Disable
PFO	- Power Fail Output

precise voltage detection at extremely low current consumption. By combining the DS1610 Partitioned NV Controller chip with a CMOS memory and batteries, nonvolatile RAM operation can be achieved.

The DS1610 Partitioned NV Controller functions like the Dallas Semiconductor DS1210 NV controller when the  $(\overline{DIS})$  disable pin is grounded. An internal pulldown resistor to ground on the  $\overline{DIS}$  pin of the DS1610S allows it to retrofit into DS1210S applications. When the  $\overline{DIS}$  pin is grounded the address inputs A<sub>W</sub> - A<sub>Z</sub> and the write enable input WEI are ignored. Also the power-fail output PFO and the write enable output WEO are tristated.

### FEATURES

- Converts CMOS RAMs into nonvolatile memories
- Automatically selects +3.0V or +5.0V operation
- SOIC version is pin compatible with the Dallas Semiconductor DS1210S and DS1610S NV Controllers
- Unconditionally write protects all of memory when  $V_{CC}$  is out of tolerance
- Write protects selected blocks of memory regardless of  $V_{CC}$  status when programmed
- Automatically switches to battery backup supply when power fail occurs
- Provides for multiple batteries
- Consumes less than 100 nA of battery current
- Tests battery on power up by inhibiting the second memory cycle
- Optional 5% or 10% Power Fail Detection
- 16-pin DIP or 16-pin SOIC surface mount package or 20-pin TSSOP package
- Low forward voltage drop on the  $V_{CC}$  switch with currents of up to 150 mA
- Optional industrial temperature range of -40°C to +85°C

### DESCRIPTION

The DS1710 is a low power CMOS circuit which solves the application problems of converting CMOS RAMS into nonvolatile memories. In addition the device has the ability to unconditionally write protect blocks of memory so that inadvertent write cycles do not corrupt program and special data space. The incoming power supply voltage at the  $V_{CC}$  input pin is constantly monitored for an out of tolerance condition. When such a condition is detected, both the chip enable and write enable outputs are inhibited to protect stored data.

### PIN ASSIGNMENT

Pinout Diagram		Pinout Diagram	
$A_W$	1	16	PF0
$V_{CCO}$	2	15	$V_{CCI}$
$A_X$	3	14	AZ
$V_{BAT1}$	4	13	$V_{BAT2}$
$A_Y$	5	12	WEO
TOL	6	11	CEO
DIS	7	10	WEI
GND	8	9	CEI

16-Pin DIP and 16-Pin SOIC

Pinout Diagram		Pinout Diagram	
$A_W$	1	20	PF0
$V_{CCO}$	2	19	$V_{CCI}$
$A_X$	3	18	AZ
$V_{BAT1}$	4	17	$V_{BAT2}$
$A_Y$	5	16	NC
NC	6	15	WEO
TOL	7	14	NC
NC	8	13	CEO
DIS	9	12	WEI
GND	10	11	CEI

20-Pin TSSOP

### PIN DESCRIPTION

$V_{CCI}$	- Input 2.7 to 5.5 Volt Supply
$V_{BAT1}$	- + Battery 1 Input
$V_{BAT2}$	- + Battery 2 Input
$V_{CCO}$	- RAM Power ( $V_{CC}$ ) Supply
GND	- Ground
CEI	- Chip Enable Input
CEO	- Chip Enable Output
WEI	- Write Enable Input
WEO	- Write Enable Output
TOL	- Power Supply Tolerance Select
$A_W - A_Z$	- Address Inputs
DIS	- Memory Partition Disable
PF0	- Power Fail Output
NC	- No Connect

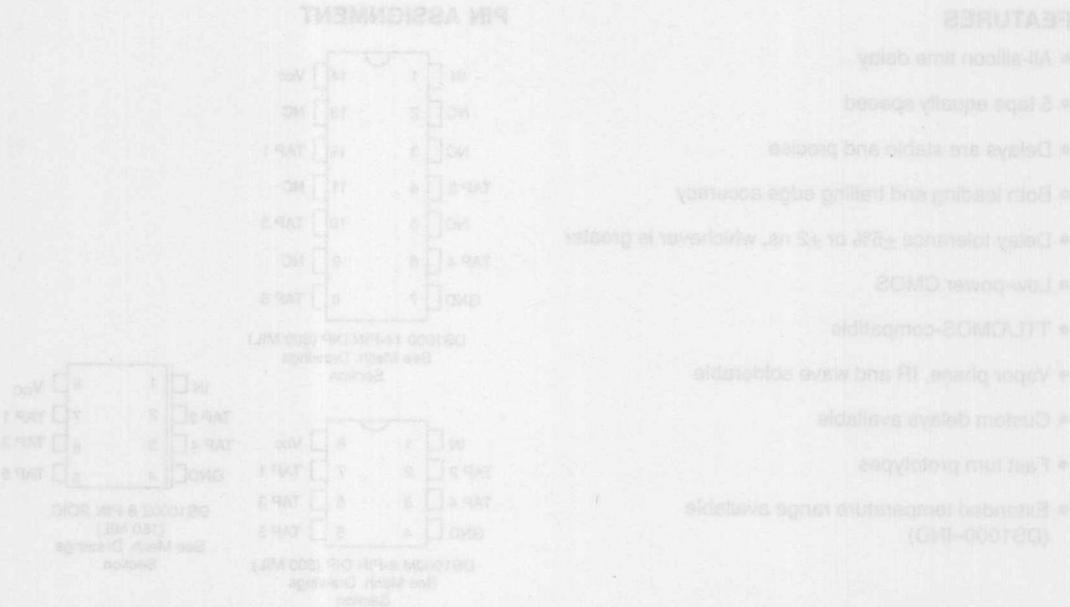
# DS1000

## 8-Tap Silicon Delay Line

# SILICON TIMED CIRCUITS

## SEMICONDUCTOR

DS1000 is a silicon integrated circuit designed for use in digital timing applications. It contains eight delay elements, each having a maximum delay of 25 ns. The DS1000 is particularly suited for applications requiring fast response times and low power consumption.



Pin Description	Function
1. TAP 1-TAP 2	TAP Outputs
2. MC	MC Input
3. GND	Ground
4. MC	MC Connection
5. IN	Input

The DS1000 is a monolithic integrated circuit designed for use in digital timing applications. It contains eight delay elements, each having a maximum delay of 25 ns. The DS1000 is particularly suited for applications requiring fast response times and low power consumption.

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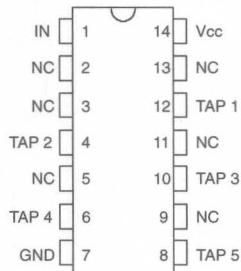


## DS1000 5-Tap Silicon Delay Line

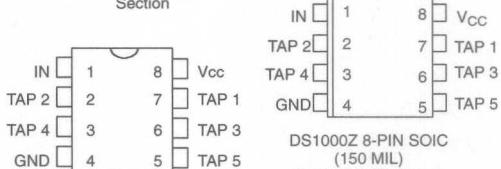
### FEATURES

- All-silicon time delay
- 5 taps equally spaced
- Delays are stable and precise
- Both leading and trailing edge accuracy
- Delay tolerance  $\pm 5\%$  or  $\pm 2$  ns, whichever is greater
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable
- Custom delays available
- Fast turn prototypes
- Extended temperature range available  
(DS1000-IND)

### PIN ASSIGNMENT



DS1000 14-PIN DIP (300 MIL)  
See Mech. Drawings  
Section



DS1000Z 8-PIN SOIC  
(150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

TAP 1-TAP 5	- TAP Output Number
V <sub>CC</sub>	- +5 Volts
GND	- Ground
NC	- No Connection
IN	- Input

### DESCRIPTION

The DS1000 series delay lines have five equally spaced taps providing delays from 4 ns to 500 ns. These devices are offered in a standard 14-pin DIP that is pin-compatible with hybrid delay lines. Alternatively, 8-pin DIPs and surface mount packages are available to save PC board area. Low cost and superior reliability over hybrid technology is achieved by the combination of a 100% silicon delay line and industry standard DIP and SOIC packaging. In order to maintain complete pin compatibility, DIP packages are available with hybrid lead configurations. The DS1000 series delay lines pro-

vide a nominal accuracy of  $\pm 5\%$  or  $\pm 2$  ns, whichever is greater. The DS1000 5-Tap Silicon Delay Line reproduces the input logic state at the output after a fixed delay as specified by the extension of the part number after the dash. The DS1000 is designed to reproduce both leading and trailing edges with equal precision. Each tap is capable of driving up to ten 74LS loads.

Dallas Semiconductor can customize standard products to meet special needs. For special requests and rapid delivery, call (972) 371-4348.

**DALLAS**  
SEMICONDUCTOR

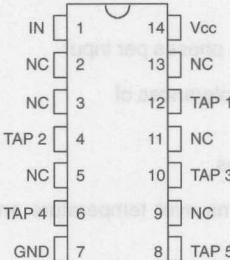
## DS1000-IND

### Industrial Temperature Range 5-Tap Silicon Delay Line

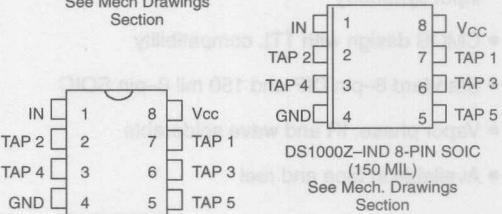
#### FEATURES

- All-silicon time delay
- 5 taps equally spaced
- Delays are stable and precise
- Both leading and trailing edge accuracy
- Delay tolerance  $\pm 5\%$  or  $\pm 2$  ns, whichever is greater (@25°C)
- Delays characterized over -40°C to +85°C temperature range ( $\pm 2$  ns or  $\pm 8\%$ )
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable
- Custom delays available
- Fast turn prototypes

#### PIN ASSIGNMENT



DS1000-IND 14-PIN DIP (300 MIL)  
See Mech Drawings Section



DS1000M-IND 8-PIN DIP  
(300 MIL)  
See Mech. Drawings Section

#### PIN DESCRIPTION

TAP 1-TAP 5	- Tap Output Number
V <sub>CC</sub>	- +5 Volts
GND	- Ground
NC	- No Connection
IN	- Input

nominal accuracy of  $\pm 5\%$  or  $\pm 2$  ns, whichever is greater. The DS1000-IND 5-Tap Silicon Delay Line reproduces the input logic state at the output after a fixed delay as specified by the extension of the part number after the dash. The DS1000-IND is designed to reproduce both leading and trailing edges with equal precision. Each tap is capable of driving up to ten 74LS loads.

Dallas Semiconductor can customize standard products to meet special needs. For special requests and rapid delivery, call (972) 371-4348.



# DS1004

## 5-Tap High-Speed Silicon Delay Line

### FEATURES

- All-silicon timing circuit
- Five equally delayed clock phases per input
- Precise tap-to-tap delay tolerances of  $\pm 0.5$ ,  $\pm 0.75$ , or  $\pm 1$  ns
- Input-to-tap 1 delay of 5 ns
- Delay tolerances of  $\pm 1.5$  ns over temperature and voltage
- Leading and trailing edge precision preserves the input symmetry
- CMOS design with TTL compatibility
- Standard 8-pin DIP and 150 mil 8-pin SOIC
- Vapor phase, IR and wave solderable
- Available in tape and reel

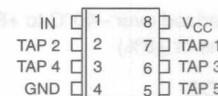
### THEMIS/2A

### PIN DESCRIPTION

### PIN ASSIGNMENT



DS1004M 8-PIN DIP  
(300 MIL)  
See Mech. Drawings  
Section



DS1004Z 8-PIN SOIC  
(150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

TAP 1-5	- Tap Output Number
V <sub>CC</sub>	- +5 Volt Supply
GND	- Ground
IN	- Input

### DESCRIPTION

The DS1004 is a 5-tap all silicon delay line which can provide 2, 3, 4, or 5 ns tap-to-tap delays within a standard part family. The device is Dallas Semiconductor's fastest 5-tap delay line. It is available in a standard 8-pin DIP and 150 mil 8-pin mini-SOIC. The device features precise leading and trailing edge accuracies and has the inherent reliability of an all-silicon delay line solution.

The DS1004 is specified for tap-to-tap tolerances as shown in Table 1. Each device has a minimum input-

to-tap 1 delay of 5 ns. Subsequent taps (taps 2 through 5) are precisely delayed by 2, 3, 4, or 5 ns. See Table 1 for details. Tolerance over temperature and voltage is  $\pm 1.5$  ns. Nominal tap-to-tap tolerances range from  $\pm 0.5$  ns to  $\pm 1.0$  ns. Each output is capable of driving up to 10 LS loads.

For customers needing non-standard delay values, the Late Package Program (LPP) is available. Customers may contact Dallas Semiconductor at (972) 371-4348 for further details.



**DS1005**  
5-Tap Silicon Delay Line

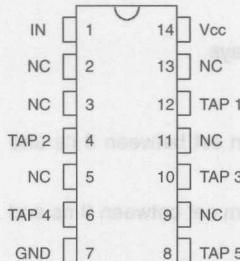
## FEATURES

- All-silicon time delay
  - 5 taps equally spaced
  - Delay tolerance  $\pm 2$  ns or  $\pm 3\%$ , whichever is greater
  - Stable and precise over temperature and voltage range
  - Leading and trailing edge accuracy
  - Economical
  - Auto-insertable, low profile
  - Standard 14-pin DIP, 8-pin DIP, or 16-pin SOIC
  - Tape and reel available for surface-mount
  - Low-power CMOS
  - TTL/CMOS compatible
  - Vapor phase, IR and wave solderability
  - Custom delays available
  - Quick turn prototypes
  - Extended temperature range available

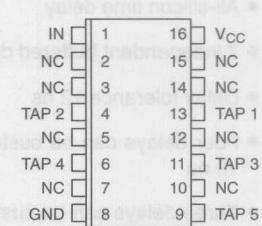
## **DESCRIPTION**

The DS1005 5-Tap Silicon Delay Line provides five equally spaced taps with delays ranging from 12 ns to 250 ns, with an accuracy of  $\pm 2$  ns or  $\pm 3\%$ , whichever is greater. This device is offered in a standard 14-pin DIP, making it compatible with existing delay line products. Space-saving 8-pin DIPs and 16-pin SOICs are also available. Both enhanced performance and superior reliability over hybrid technology is achieved by the combination of a 100% silicon delay line and industry standard DIP and SOIC packaging. In order to maintain complete

## PIN ASSIGNMENT



DS1005 14-PIN DIP (300 MIL)  
See Mech. Drawings  
Section



DS1005S 16-PIN SOIC  
(300 MIL)  
See Mech. Drawings  
Section



DS1005M 8-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

## PIN DESCRIPTION

TAP 1 – TAP 5	– Tap Output Number
V <sub>CC</sub>	– +5 Volts
GND	– Ground
NC	– No Connection
IN	– Input

pin compatibility, DIP packages are available with hybrid lead configurations. The DS1005 reproduces the input logic level at each tap after the fixed delay specified by the dash number in NO TAG. The device is designed with both leading and trailing edge accuracy. Each tap is capable of driving up to ten 74LS loads. Dallas Semiconductor can customize standard products to meet special needs. For special requests and rapid delivery, call (972) 371-4348.

**DALLAS**  
SEMICONDUCTOR

# DS1007

## 7-in-1 Silicon Delay Line

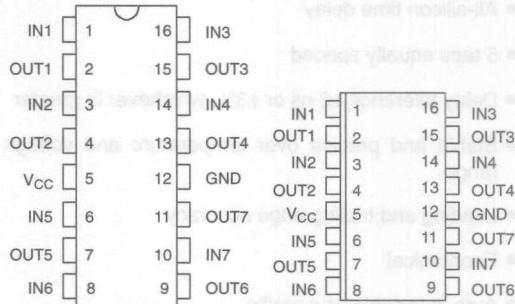
### FEATURES

- All-silicon time delay
- 7 independent buffered delays
- Delay tolerance  $\pm 2$  ns
- Four delays can be custom set between 3 ns and 10 ns
- Three delays can be custom set between 9 ns and 40 ns
- Delays are stable and precise
- Economical
- Auto-insertable, low profile
- Surface mount 16-pin SOIC
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable
- Custom specifications available
- Quick turn prototypes

### DESCRIPTION

The DS1007 7-in-1 Silicon Delay Line provides seven independent delay times which are set by Dallas Semiconductor to the customer's specification. The delay times can be set from 3 ns to 40 ns with an accuracy of  $\pm 2$  ns at room temperature. The device is offered in both a 16-pin DIP and a 16-pin SOIC. Since the DS1007 is an all-silicon solution, better economy and reliability are

### PIN ASSIGNMENT



DS1007 16-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

DS1007S 16-PIN SOIC  
(300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN1 - IN7	- Inputs
Out1 - Out7	- Outputs
GND	- Ground
V <sub>CC</sub>	- +5 Volts

achieved when compared to older methods using hybrid technology. The DS1007 reproduces the input logic state at the output after the fixed delay. Dallas Semiconductor can customize standard products to meet special needs. For special requests and rapid delivery, call (972) 371-4348.

**DALLAS**  
SEMICONDUCTOR

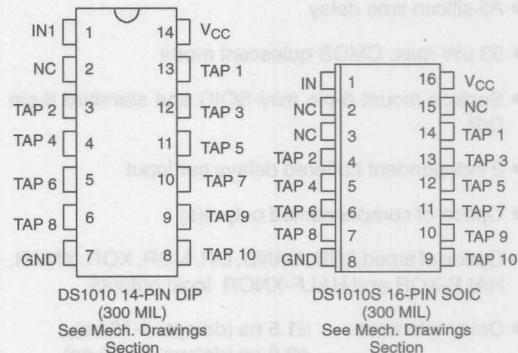
# DS1010

## 10-Tap Silicon Delay Line

### FEATURES

- All-silicon time delay
- 10 taps equally spaced
- Delays are stable and precise
- Leading and trailing edge accuracy
- Delay tolerance  $\pm 5\%$  or  $\pm 2$  ns, whichever is greater
- Economical
- Auto-insertable, low profile
- Standard 14-pin DIP or 16-pin SOIC
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable
- Custom delays available
- Fast turn prototypes

### PIN ASSIGNMENT



### PIN DESCRIPTION

TAP 1-TAP 10	- Tap Output Number
V <sub>CC</sub>	- 5 Volts
GND	- Ground
NC	- No Connection
IN	- Input

### DESCRIPTION

The DS1010 series delay line has ten equally spaced taps providing delays from 5 ns to 500 ns. The devices are offered in a standard 14-pin DIP which is pin-compatible with hybrid delay lines. Alternatively, a 16-pin SOIC is available for surface mount technology which reduces PC board area. Since the DS1010 is an all-silicon solution, better economy is achieved when compared to older methods using hybrid techniques. The DS1010 series delay lines provide a nominal accuracy

of  $\pm 5\%$  or  $\pm 2$  ns, whichever is greater. The DS1010 reproduces the input logic state at the TAP 10 output after a fixed delay as specified by the dash number extension of the part number. The DS1010 is designed to produce both leading and trailing edge with equal precision. Each tap is capable of driving up to ten 74LS type loads. Dallas Semiconductor can customize standard products to meet special needs. For special requests and rapid delivery, call (972) 371-4348.

**DALLAS**  
SEMICONDUCTOR

## DS1012 2-in-1 Sub-Miniature Silicon Delay Line with Logic

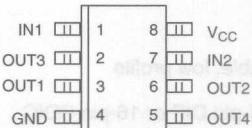
### FEATURES

- All-silicon time delay
- 53  $\mu$ W max. CMOS quiescent mode
- Surface mount 8-pin mini-SOIC and standard 8-pin DIP
- 2 independent buffered delays per input
- Option of complemented output(s)
- Option of timed AND, NAND, OR, NOR, XOR, XNOR, HALF-XOR and HALF-XNOR logic outputs
- Delay tolerance:  $\pm 1.5$  ns (delays: 3-10 ns),  
 $\pm 2.0$  ns (delays: 11-40 ns)
- Vapor phase, IR and wave solderability
- Economical
- TTL/CMOS-compatible
- Quick turn prototypes
- Custom delays and logic options available

### PIN ASSIGNMENT



DS1012M 8-PIN DIP (300 MIL)  
See Mech. Drawings  
Section



DS1012Z 8-PIN SOIC (150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN1, IN2	– Inputs
OUT1, OUT2	– Outputs (delays)
OUT3, OUT4	– Outputs (delays, logic)
GND	– Ground
V <sub>CC</sub>	– +5 Volts

catalog parts configured with logic functions on OUT3 and OUT4. Note that DS1012-2 also utilizes an output inversion on OUT2.

In any configuration, delays D1 ( $t_{D1}$ ) and D2 ( $t_{D2}$ ) can be specified within the range of ~3 ns to 10 ns. Delays D3 ( $t_{D3}$ ) and D4 ( $t_{D4}$ ) can be specified to have values between ~3 ns and 40 ns. The worst case leading edge delay accuracy at nominal voltage and room temperature is  $\pm 2$  ns. The DS1012 is offered in two packages: an 8-pin DIP and an 8-pin 150 mil wide mini-SOIC.

Dallas Semiconductor offers the DS1012 in a wide variety of custom delay and logic configurations. For special requests and quick turn delivery, call (972) 371-4348.

### DESCRIPTION

In its most simple configuration, the DS1012 2-in-1 Sub-Miniature Silicon Delay Line Chip provides two inputs, each of which in turn provides independent delays to a pair of outputs. The DS1012-1 and DS1012-3 are examples of catalog parts having this basic configuration. Any of the four outputs can be inverted at the time of manufacture.

For applications requiring two-input timed logic functions, at the time of manufacture the simple delay on OUT4 can be replaced by one of the following: OR, NOR, XOR, or XNOR. Similarly, a timed AND, NAND, HALF-XOR (D3 AND  $\overline{D4}$ ), or NOT HALF-XOR ( $\overline{D3}$  OR D4) can be substituted for the simple delay on OUT3. DS1012-2, DS1012-4, and DS1012-5 are examples of

**DALLAS**  
SEMICONDUCTOR

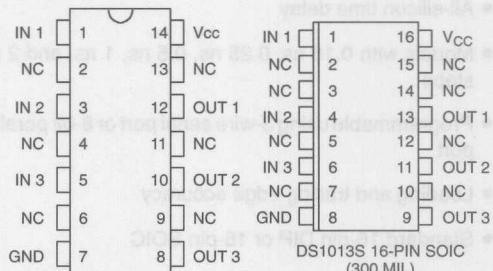
# DS1013

## 3-in-1 Silicon Delay Line

### FEATURES

- All-silicon time delay
- 3 independent buffered delays
- Delay tolerance  $\pm 2\text{ns}$  for -10 through -60
- Stable and precise over temperature and voltage range
- Leading and trailing edge accuracy
- Economical
- Auto-insertable, low profile
- Standard 14-pin DIP, 8-pin DIP, or 16-pin SOIC
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable
- Custom delays available
- Quick turn prototypes
- Extended temperature ranges available

### PIN ASSIGNMENT



DS1013 14-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

### DS1013

DS1013S 16-PIN SOIC  
(300 MIL)  
See Mech. Drawings  
Section



DS1013M 8-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN 1, IN 2, IN 3	— Inputs
OUT 1, OUT 2, OUT 3	— Outputs
GND	— Ground
V <sub>CC</sub>	— +5 Volts
NC	— No Connection

### DESCRIPTION

The DS1013 series of delay lines has three independent logic buffered delays in a single package. The devices are offered in a standard 14-pin DIP which is pin-compatible with hybrid delay lines. Alternative 8-pin DIP and surface mount packages are available which save PC board area. Since the DS1013 products are an all silicon solution, better economy is achieved when compared to older methods using hybrid techniques. The DS1013 series delay lines provide a nominal accuracy of  $\pm 2\text{ns}$  for delay times ranging from 10 ns to 60 ns, in-

creasing to 5% for delays of 150 ns and longer. The DS1013 delay line reproduces the input logic state at the output after a fixed delay as specified by the dash number extension of the part number. The DS1013 is designed to reproduce both leading and trailing edges with equal precision. Each output is capable of driving up to ten 74LS loads. Dallas Semiconductor can customize standard products to meet special needs. For special requests and rapid delivery, call (972) 371-4348.

**DALLAS**  
SEMICONDUCTOR

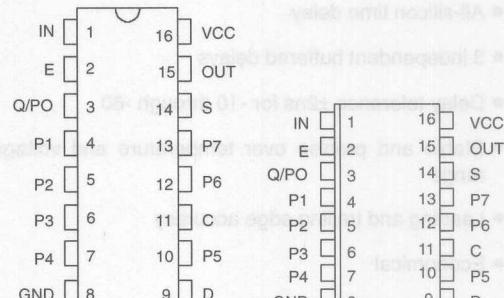
# DS1020

## Programmable 8-Bit Silicon Delay Line

### FEATURES

- All-silicon time delay
- Models with 0.15 ns, 0.25 ns, 0.5 ns, 1 ns, and 2 ns steps
- Programmable using 3-wire serial port or 8-bit parallel port
- Leading and trailing edge accuracy
- Standard 16-pin DIP or 16-pin SOIC
- Economical
- Auto-insertable, low profile
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable

### PIN ASSIGNMENT



### PIN DESCRIPTION

IN	- Delay Input
P0-P7	- Parallel Program Pins
GND	- Ground
OUT	- Delay Output
VCC	- +5 Volts
S	- Mode Select
E	- Enable
C	- Serial Port Clock
Q	- Serial Data Output
D	- Serial Data Input

### DESCRIPTION

The DS1020 Programmable 8-Bit Silicon Delay Line consists of an 8-bit, user-programmable CMOS silicon integrated circuit. Delay values, programmed using either the 3-wire serial port or the 8-bit parallel port, can be varied over 256 equal steps. The fastest model (-15) offers a maximum delay of 48.25 ns with an incremental delay of 0.15 ns, while the slowest model (-200) has a maximum delay of 520 ns with an incremental delay of 2 ns. All models have an inherent (step zero) delay of 10 ns. After the user-determined delay, the input logic

state is reproduced at the output without inversion. The DS1020 is TTL- and CMOS-compatible, capable of driving 10 74LS-type loads, and features both rising and falling edge accuracy.

The all-CMOS DS1020 integrated circuit has been designed as a reliable, economic alternative to hybrid programmable delay lines. It is offered in a standard 16-pin auto-insertable DIP and a space-saving surface mount 16-pin SOIC.

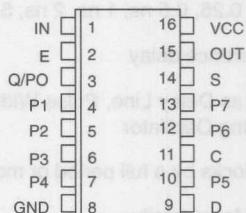


# DS1021 Programmable 8-Bit Silicon Delay Line

## FEATURES

- All-silicon time delay
- Models with 0.25 ns and 0.5 ns steps
- Programmable using 3-wire serial port or 8-bit parallel port
- Leading and trailing edge accuracy
- Economical
- Auto-insertable, low profile, 16-pin SOIC package
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable

## PIN ASSIGNMENT



DS1021S 16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section

## PIN DESCRIPTION

IN	- Delay Input
P0-P7	- Parallel Program Pins
GND	- Ground
OUT	- Delay Output
VCC	- +5 Volts
S	- Mode Select
E	- Enable
C	- Serial Port Clock
Q	- Serial Data Output
D	- Serial Data Input

## DESCRIPTION

The DS1021 Programmable 8-Bit Silicon Delay Line consists of an 8-bit, user-programmable CMOS silicon integrated circuit. Delay values, programmed using either the 3-wire serial port or the 8-bit parallel port, can be varied over 256 equal steps. The faster model (-25) offers a maximum delay of 73.75 ns with an incremental delay of 0.25 ns, while the slower model (-50) has a maximum delay of 137.5 ns with an incremental delay of 0.5 ns. Both models have an inherent (step zero) delay of 10 ns. After the user-determined delay, the input logic state is reproduced at the output without inversion. The DS1021 is TTL- and CMOS-compatible, capable of driving 10 74LS-type loads, and features both rising and falling edge accuracy.

The all-CMOS DS1021 integrated circuit has been designed as a reliable, economic alternative to hybrid programmable delay lines. It is offered in a space-saving surface mount 16-pin SOIC.

**DALLAS**  
SEMICONDUCTOR

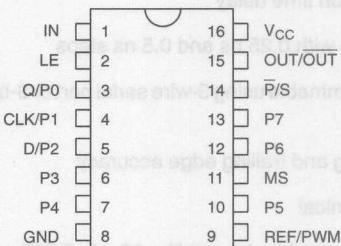
# DS1023

## 8-Bit Programmable Timing Element

### FEATURES

- Step sizes of 0.25, 0.5 ns, 1 ns, 2 ns, 5 ns
- On-chip Reference delay
- Configurable as Delay Line, Pulse Width Modulator, or Free-running Oscillator
- Can Delay Clocks by a full period or more
- Guaranteed Monotonicity
- Parallel or Serial Programming
- Single 5V Supply
- 16-pin DIP or SOIC Package

### PIN ASSIGNMENT



DS1023 300-MIL DIP  
DS1023S 300-MIL SOIC

### PIN DESCRIPTIONS

IN	– Input
P0/Q	– Parallel Input P0 (parallel mode)
P1/CLK	– Serial Data Output (serial mode)
P2/D	– Parallel Input P1 (parallel mode)
	– Serial Input Clock (serial mode)
P3 – P7	– Parallel Input P2 (parallel mode)
GND	– Serial Data Input (serial mode)
OUT/OUT	– Remaining Parallel Inputs
REF/PWM	– Ground
/S	– Output
MS	– Reference or PWM Output
LE	– Parallel / Serial Programming Select
V <sub>CC</sub>	– Output Mode Select
	– Input Latch Enable
	– Supply Voltage

### DESCRIPTION

The DS1023 is an 8-bit programmable Delay Line similar in function to the DS1020/DS1021.

Additional features have been added to extend the range of applications:

The internal delay line architecture has been revised to allow clock signals to be delayed by up to a full period or more. Combined with an on-chip reference delay (to offset the inherent or "step zero" delay of the device) clock phase can now be varied over the full 0–360 degree range.

On-chip gating is provided to allow the device to provide a pulse width modulated output, triggered by the input with duration set by the programmed value.

Alternatively the output signal may be inverted on-chip, allowing the device to perform as a free-running oscillator if the output is (externally) connected to the input.

### Programming

The device programming is identical to the DS1020/DS1021. Note, however, that the serial clock and data pins are shared with three of the parallel input pins.

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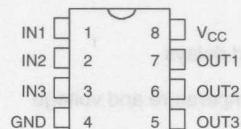
# DS1033

## 3-in-1 Low Voltage Silicon Delay Line

### FEATURES

- All-silicon timing circuit
- Three independent buffered delays
- Initial delay tolerance  $\pm 1.5$  ns
- Stable and precise over temperature and voltage
- Leading and trailing edge precision preserves the input symmetry
- Standard 8-pin DIP, 8-pin SOIC
- Vapor phasing, IR and wave solderable
- Available in tape and reel

### PIN ASSIGNMENT



DS1033M 8-PIN DIP  
See Mech. Drawings  
Section



DS1033Z 8-PIN SOIC (150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN1-IN3	- Input Signals
OUT1-OUT3	- Output Signals
NC	- No Connection
V <sub>CC</sub>	- Supply Voltage
GND	- Ground
(Sub)	- Internal substrate connection, do not make any external connections to these pins

### DESCRIPTION

The DS1033 series is a low-power +3.3 Volt version of the DS1035. It is characterized for operation over the range of 2.7V to 3.6V.

The DS1033 series of delay lines have three independent logic buffered delays in a single package. It is available in a standard 8-pin DIP and 150 mil, 8-pin mini-SOIC.

The device features precise leading and trailing edge accuracies. It has the inherent reliability of an all-silicon

delay line solution. The DS1033's nominal tolerance is  $\pm 1.5$  ns and an additional tolerance over temperature and voltage of  $\pm 1.0$  ns for the faster delays. Detailed specifications are shown in Table 1.

Standard delay values are indicated in Table 1. Customers may contact Dallas Semiconductor at (972) 371-4348 for further information.

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# DS1035

## 3-in-1 High-Speed Silicon Delay Line

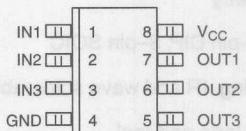
### FEATURES

- All-silicon timing circuit
- Three independent buffered delays
- Stable and precise over temperature and voltage
- Leading and trailing edge precision preserves the input symmetry
- Standard 8-pin DIP and 8-pin SOIC (150 mil)
- Vapor phasing, IR and wave solderable
- Available in tape and reel

### PIN ASSIGNMENT



DS1035M 8-PIN DIP  
See Mech. Drawings  
Section



DS1035Z 8-PIN SOIC (150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN1-IN3	— Input Signals
OUT1-OUT3	— Output Signals
NC	— No Connection
V <sub>CC</sub>	— +5-Volt Supply
GND	— Ground
(Sub)	— Internal substrate connection; do not make any external connections to these pins

### DESCRIPTION

The DS1035 series is a low-power +5-Volt high speed version of the popular DS1013 and complements the DS1033 +3.3-Volt version.

The DS1035 series of delay lines have three independent logic buffered delays in a single package. The device is Dallas Semiconductor's fastest 3-in-1 delay line. It is available in a standard 8-pin DIP and 150-mil, 8-pin mini-SOIC.

The device features precise leading and trailing edge accuracies. It has the inherent reliability of an all-silicon delay line solution. The DS1035's initial tolerance is  $\pm 1.5$  or  $\pm 2.0$  ns with an additional tolerance over temperature and voltage of  $\pm 1.0$  ns or  $\pm 1.5$  ns, depending on the delay value. Each output is capable of driving up to 10 LS loads.

Standard delay values are indicated in Table 1. Customers may contact Dallas Semiconductor at (972) 371-4348 for further information.

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## DS1040 Programmable One-Shot Pulse Generator

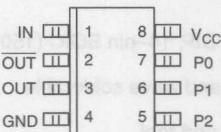
### FEATURES

- All-silicon pulse width generator
- Five programmable widths
- Equal and unequal increments available
- Pulse widths from 5 ns to 500 ns
- Widths are stable and precise
- Rising edge-triggered
- Inverted and non-inverted outputs
- Width tolerance  $\pm 5\%$  or  $\pm 2$  ns, whichever is greater
- Economical
- Auto-insertable, low profile
- Low-power CMOS
- TTL/CMOS-compatible
- Vapor phase, IR and wave solderable
- Custom widths available
- Fast turn prototypes
- Extended temperature range available

### PIN ASSIGNMENT



DS1040M 8-PIN DIP (300 MIL)  
See Mech. Drawings  
Section



DS1040Z 8-PIN SOIC (150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN	— Trigger Input
P0-P2	— Programming Pins
GND	— Ground
OUT	— Pulse Output
OUT	— Inverted Pulse Output
V <sub>CC</sub>	— +5V

### DESCRIPTION

The DS1040 Pulse Generator is a user-programmable one-shot with a choice of five precise pulse widths. Maximum widths range from 50 ns to 500 ns; increments range from 2.5 ns to 100 ns. For maximum flexibility in applications such as magneto-optical read/write disk laser power control, varieties are offered with equal and unequal increments. The DS1040 is offered in standard 8-pin DIPs and 8-pin mini-SOICs. Low cost and superior reliability over hybrid technology are achieved by the combination of a 100% CMOS silicon design and industry standard packaging. The DS1040 series of pulse generators provide a nominal width accuracy of  $\pm 5\%$  or

$\pm 2$  ns, whichever is greater. In response to the rising edge of the input (trigger) pulse, the DS1040 produces an output pulse with a width determined by the logic states of the three parallel programming pins. For convenience, both inverting and non-inverting outputs are supplied. The intrinsic delay between the trigger pulse and the output pulse is no more than 10 ns. Each output is capable of driving up to five 74LS loads.

Dallas Semiconductor can customize standard products to meet special needs. For special request and rapid delivery, call (972) 371-4348.

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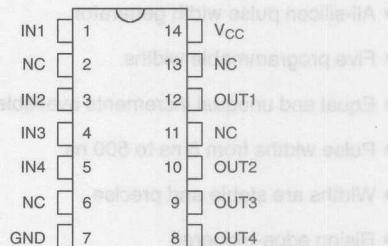
# DS1044

## 4-in-1 High-Speed Silicon Delay Line

### FEATURES

- All-silicon timing circuit
- Four independent buffered delays
- Initial delay tolerance  $\pm 1.5$  ns
- Stable and precise over temperature and voltage
- Leading and trailing edge precision preserves the input symmetry
- Standard 14-pin DIP, 14-pin SOIC (150 mil)
- Vapor phase, IR and wave solderable
- Available in tape and reel

### PIN ASSIGNMENT



DS1044 14-PIN DIP  
DS1044R 14-PIN SOIC (150 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN1-IN4	— Input Signals
OUT1-OUT4	— Output Signals
NC	— No Connection
V <sub>CC</sub>	— +5-Volt Supply
GND	— Ground

### DESCRIPTION

The DS1044 series is a 4-in-1 version of the low-power, +5-Volt, high speed DS1035.

The DS1044 series of delay lines have four independent logic buffered delays in a single package. The device is Dallas Semiconductor's fastest 4-in-1 delay line. It is available in a standard 14-pin DIP and 14-pin SOIC.

The device features precise leading and trailing edge accuracies. It has the inherent reliability of an all-silicon

delay line solution. The DS1044's nominal tolerance is  $\pm 1.5$  ns with an additional tolerance over temperature and voltage of  $\pm 1.0$  ns for the faster delays. Each output is capable of driving up to 10 LS loads.

Standard delay values are indicated in Table 1. Customers may contact Dallas Semiconductor at (972) 371-4348 for further information.

**DALLAS**  
SEMICONDUCTOR

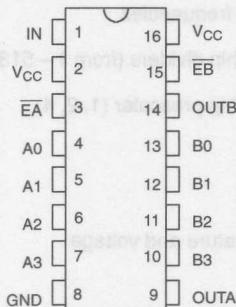
# DS1045

## 4-Bit Dual Programmable Delay Line

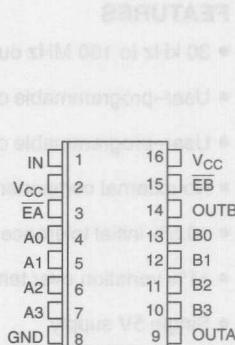
### FEATURES

- All-silicon time delay
- Two programmable outputs from a single input produce output-to-output delays between 9 and 84 ns depending on device type
- Programmable via four input pins
- Programmable increments of 2 to 5 ns with a minimum of 9 ns and a maximum of 84 ns
- Output pulse is a reproduction of input pulse after delay with both leading and trailing edge accuracy
- Standard 16-pin DIP or surface mount 16-pin SOIC
- Auto-insertable
- Low-power CMOS design is TTL-compatible

### PIN ASSIGNMENT



DS1045 16-PIN DIP  
See Mech. Drawings  
Section



DS1045S 16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

IN	— Delay Line Input
OUTA, OUTB	— Delay Line Outputs
A0-A3	— Parallel Program Inputs for OUT1
B0-B3	— Parallel Program Inputs for OUT2
EA, EB	— Enable A and B Inputs
V <sub>CC</sub>	— +5 Volt Input
GND	— Ground

### DESCRIPTION

The DS1045 is a programmable silicon delay line having one input and two 4-bit programmable delay outputs. Each 4-bit programmable output offers the user 16 possible delay values to select from, starting with a minimum inherent DS1045 delay of 9 ns and a maximum achievable delay in the standard DS1045 family of 84 ns. The standard DS1045 product line provides the user with four devices having uniform delay increments of 2, 3, 4, and 5 ns depending on the device. Table 1 presents standard device family and delay capability. Additionally, custom delay increments are available for special order through Dallas Semiconductor.

The DS1045 is TTL and CMOS-compatible and capable of driving ten 74LS-type loads. The output produced by the DS1045 is both rising and falling edge precise. The DS1045 programmable silicon delay line has been designed as a reliable, economic alternative to hybrid programmable delay lines. It is offered in a standard 16-pin auto-insertable DIP and a space-saving surface mount 16-pin SOIC package.

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# DS1065

## EconOscillator/Divider

### FEATURES

- 30 kHz to 100 MHz output frequencies
- User-programmable on-chip dividers (from 1 – 513)
- User-programmable on-chip prescaler (1, 2, 4)
- No external components
- $\pm 0.5\%$  initial tolerance
- $\pm 1\%$  variation over temperature and voltage
- Single 5V supply

### PIN ASSIGNMENT



BOTTOM  
VIEW

### FREQUENCY OPTIONS

Part No.	Max O/P freq.
DS1065-100	100 MHz
DS1065-80	80 MHz
DS1065-66	66 MHz
DS1065-60	60 MHz

### DESCRIPTION

The DS1065 is a fixed frequency oscillator requiring no external components for operation. Numerous operating frequencies are possible in the range 30 kHz to 100 MHz through the use of an on-chip programmable prescaler and divider.

The DS1065 features a master oscillator followed by a prescaler and then a programmable divider. The prescaler and programmable divider are user-programmable with the desired values being stored in nonvolatile memory. This allows the user to buy an off the shelf component and program it on site prior to board production. Design changes can be accommodated easily by simply programming different values into the device (or reprogramming previously programmed devices).

### PIN DESCRIPTIONS

#### TO-92

1 I/O	– Input/Output
2 V <sub>CC</sub>	– Power Supply
3 GND	– Ground

The DS1065 is shipped from the factory configured for half the maximum operating frequency. Pre-programmed devices can be ordered on a custom basis as DS1065C-xxx.

The DS1065 features a dual-purpose Input/Output pin. If the device is powered up in Program mode this pin can be used to input serial data to the on-chip registers. After a Write command this data is stored in nonvolatile memory. When the chip is subsequently powered up in operating mode these values are automatically restored to the on-chip registers and the Input/Output pin becomes the oscillator output.

The DS1065 is available in TO-92 (3 LEAD) package, allowing the generation of a clock signal easily, economically and using minimal board area.

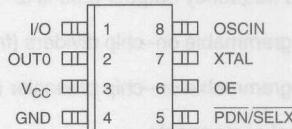
**DALLAS**  
SEMICONDUCTOR

## DS1073 3-Volt EconOscillator/Divider

### FEATURES

- Dual fixed frequency outputs (30 kHz – 100 MHz)
- User-programmable on-chip dividers (from 1 – 513)
- User-programmable on-chip prescaler (1, 2, 4)
- No external components
- $\pm 0.5\%$  initial tolerance
- $\pm 1\%$  variation over temperature and voltage
- Internal clock, external clock or crystal reference options
- 2.7 – 3.6V supply
- Power-down mode
- Synchronous output gating

### PIN ASSIGNMENT



DS1073Z 150-MIL SOIC  
DS1073M 300-MIL DIP

### FREQUENCY OPTIONS

Part No.	Max O/P freq.
DS1073-100	100 MHz
DS1073-80	80 MHz
DS1073-66	66 MHz
DS1073-60	60 MHz

### DESCRIPTION

The DS1073 is a fixed frequency oscillator requiring no external components for operation. Numerous operating frequencies are possible in the range 30 kHz to 100 MHz through the use of an on-chip programmable prescaler and divider.

The DS1073 features a master oscillator followed by a prescaler and then a programmable divider. The prescaler and programmable divider are user-programmable with the desired values being stored in non-volatile memory. This allows the user to buy an off-the-shelf component and program it on site prior to board production. Design changes can be accommodated on the fly by simply programming different values into the device (or reprogramming previously programmed devices).

The DS1073 is shipped from the factory configured for half the maximum operating frequency. Preprogrammed devices can be ordered on a custom basis as

DS1073C-xxx. As alternatives to the on-board oscillator an external clock signal or a crystal may be used as a reference. The choice of reference source (internal or external) is user-selectable at the time of programming (or on the fly if the SEL mode is chosen).

The DS1073 features a dual-purpose Input/Output pin. If the device is powered up in Program mode this pin can be used to input serial data to the on chip registers. After a Write command this data is stored in non-volatile memory. When the chip is subsequently powered up in operating mode these values are automatically restored to the on-chip registers and the Input/Output pin becomes the oscillator output.

The DS1073 is available in 8-pin DIP or SOIC packages, allowing the generation of a clock signal easily, economically and using minimal board area.

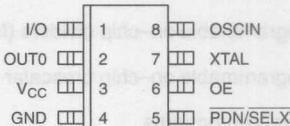
**DALLAS**  
SEMICONDUCTOR

**DS1075**  
EconOscillator/Divider

### FEATURES

- Dual fixed frequency outputs (200 kHz – 100 MHz)
- User-programmable on-chip dividers (from 1 – 513)
- User-programmable on-chip prescaler (1, 2, 4)
- No external components
- $\pm 0.5\%$  initial tolerance
- $\pm 1\%$  variation over temperature and voltage
- Internal clock, external clock or crystal reference options
- Single 5V supply
- Power-down mode
- Synchronous output gating

### PIN ASSIGNMENT



DS1075Z 150-MIL SOIC  
DS1075M 300-MIL DIP

### FREQUENCY OPTIONS

Part No.	Max O/P freq.
DS1075-100	100 MHz
DS1075-80	80 MHz
DS1075-66	66 MHz
DS1075-60	60 MHz

### DESCRIPTION

The DS1075 is a fixed frequency oscillator requiring no external components for operation. Numerous operating frequencies are possible in the range 0.2 to 100 MHz through the use of an on-chip programmable prescaler and divider.

The DS1075 features a master oscillator followed by a prescaler and then a programmable divider. The prescaler and programmable divider are user-programmable with the desired values being stored in non-volatile memory. This allows the user to buy an off-the-shelf component and program it on site prior to board production. Design changes can be readily accommodated by programming, or reprogramming, the desired values into the on-chip non-volatile registers. An evaluation board, the DS1075K, is available to simplify this task.

The DS1075 is shipped from the factory configured for half the maximum operating frequency. Prepro-

grammed devices can be ordered on a custom basis as DS1075C-xxx. As alternatives to the on-board oscillator an external clock signal or a crystal may be used as a reference. The choice of reference source (internal or external) is user-selectable at the time of programming (or on the fly if the SEL mode is chosen).

The DS1075 features a dual-purpose Input/Output pin. If the device is powered up in Program mode this pin can be used to input serial data to the on chip registers. After a Write command this data is stored in non-volatile memory. When the chip is subsequently powered up in operating mode these values are automatically restored to the on-chip registers and the Input/Output pin becomes the oscillator output.

The DS1075 is available in 8-pin DIP or SOIC packages, allowing the generation of a clock signal easily, economically and using minimal board area.

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## DS1075-IND

### EconOscillator/Divider

#### FEATURES

- Dual fixed frequency outputs (30 kHz – 100 MHz)
- User-programmable on-chip dividers (from 1 – 513)
- User-programmable on-chip prescaler (1, 2, 4)
- No external components
- $\pm 0.5\%$  initial tolerance
- $\pm 3\%$  variation over temperature and voltage
- Internal clock, external clock or crystal reference options
- Single 5V supply
- Power-down mode
- Synchronous output gating

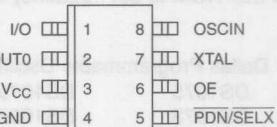
#### DESCRIPTION

The DS1075-IND is a fixed frequency oscillator requiring no external components for operation. Numerous operating frequencies are possible in the range 30 kHz to 100 MHz through the use of an on-chip programmable prescaler and divider.

The DS1075-IND features a master oscillator followed by a prescaler and then a programmable divider. The prescaler and programmable divider are user-programmable with the desired values being stored in non-volatile memory. This allows the user to buy an off-the-shelf component and program it on site prior to board production. Design changes can be accommodated on the fly by simply programming different values into the device (or reprogramming previously programmed devices).

The DS1075-IND is shipped from the factory configured for half the maximum operating frequency. Prepro-

#### PIN ASSIGNMENT



DS1075Z 150-MIL SOIC  
DS1075M-IND 300-MIL DIP

#### FREQUENCY OPTIONS

Part No.	Max O/P freq.
DS1075-100 IND	100 MHz
DS1075-80 IND	80 MHz
DS1075-66 IND	66 MHz
DS1075-60 IND	60 MHz

grammed devices can be ordered on a custom basis as DS1075C-IND. As alternatives to the on-board oscillator an external clock signal or a crystal may be used as a reference. The choice of reference source (internal or external) is user-selectable at the time of programming (or on the fly if the SEL mode is chosen).

The DS1075-IND features a dual-purpose Input/Output pin. If the device is powered up in Program mode this pin can be used to input serial data to the on chip registers. After a Write command this data is stored in non-volatile memory. When the chip is subsequently powered up in operating mode these values are automatically restored to the on-chip registers and the Input/Output pin becomes the oscillator output.

The DS1075-IND is available in 8-pin DIP or SOIC packages, allowing the generation of a clock signal easily, economically and using minimal board area.



# DS1075K Oscillator Programming/Evaluation Kit

## FEATURES

- Programs EEPROM to set frequency and operating modes
- Supports Dallas Programmable Oscillator family
 

DS1075	DS1075-IND
DS1073	DS1065
- Operates with a PC compatible host system
- Easy Windows installation (Win95 or higher)
- Demonstrates
  - ease of Programming frequency changes via the Prescaler and Divider
  - reference choices, Internal-External-Crystal Oscillator
  - power down mode
  - output enable/disable

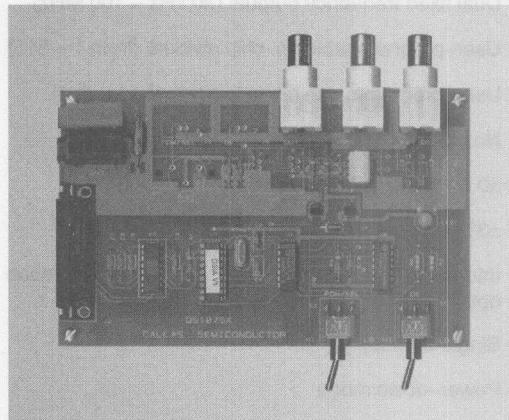
## Kit Contents

1. 1pc. Program/Evaluation PC board
2. 1pc. 3.5 floppy disk with Software
3. Samples (300 mil DIP)
  - 2 DS1075M-060
  - 2 DS1075M-066
  - 2 DS1075M-080
  - 2 DS1075M-100

## DESCRIPTION

The DS1075K Programming/Evaluation Kit makes programming and performance evaluation of the Dallas Oscillator product line easy. It contains everything you need to program the Dallas Programmable Oscillators, with this kit the user can change the register setting that control the mode of operation and the divide by number for the selection of output frequency desired.

## DS1075K Programming/Evaluation Kit



## Equipment Needed

To use the DS1075K, you will need

1. An IBM-compatible PC running Microsoft windows 95 with a 3.5 floppy drive and an available serial port
2. A 5 volt power supply with suitable connectors to fit the banana jacks on the PC Board
3. A RS232 cable with DB25 connector to connect from the PC serial port to the kit

The kit makes programming as easy and fast as a "click of the mouse" and you have changed the EEPROM register setting that control the frequency selection and operation mode.

For more information contact:

Technical Product Information, call (972)-371-4448 or Fax (972)-371-3715  
 Application Support (972)-371-6641  
 Marketing Support (972)-371-3791  
 Credit Card Sales (972)-336-6933

## SYSTEM EXTENSION

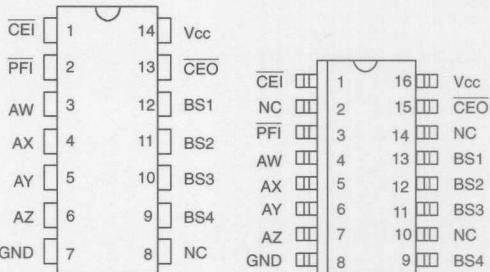
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## DS1222 BankSwitch Chip

### FEATURES

- Provides bank switching for 16 banks of memory
- Bank switching is software-controlled by a pattern recognition sequence on four address inputs
- Automatically sets all 16 banks off on power-up
- Bank switching logic allows only one bank on at a time
- Custom recognition patterns are available to prevent unauthorized access
- Full  $\pm 10\%$  operating range
- Low-power CMOS circuitry
- Can be used to expand the address range of microprocessors and decoders
- Optional 16-pin SOIC surface mount package

### PIN ASSIGNMENT



DS1222 14-Pin DIP (300 MIL)

See Mech. Drawings Section

DS1222S16-Pin SOIC (300 MIL)

See Mech. Drawings Section

### PIN DESCRIPTION

<u>A<sub>w</sub>-A<sub>Z</sub></u>	— Address Inputs
<u>C<sub>EI</sub></u>	— Chip Enable Input
<u>C<sub>EO</sub></u>	— Chip Enable Output
<u>N<sub>C</sub></u>	— No Connection
<u>B<sub>S1,B<sub>S2</sub></sub></u> , <u>B<sub>S3,B<sub>S4</sub></sub></u>	— Bank Select Outputs
<u>P<sub>FI</sub></u>	— Power Fail Input
<u>V<sub>CC</sub></u>	— +5 Volts
<u>G<sub>ND</sub></u>	— Ground

### DESCRIPTION

The DS1222 BankSwitch Chip is a CMOS circuit designed to select one of sixteen memory banks under software control. Memory bank switching allows for an increase in memory capacity without additional address lines. Continuous blocks of memory are enabled by selecting the proper memory bank through a pattern recognition sequence on four address inputs. Custom patterns available from Dallas Semiconductor can provide security through uniqueness and prevent unauthorized access. By combining the DS1222 with the DS1212 Nonvolatile Controller x16 Chip, up to 16 banks of static RAMs can be selected.

### OPERATION – BANK SWITCHING

Initially, on power-up all four bank select outputs are low and the chip enable output (C<sub>EO</sub>) is held high. (Note:

the power fail input [P<sub>FI</sub>] must be low prior to power-up to assure proper initialization.) Bank switching is achieved by matching a predefined pattern stored within the DS1222 with a 16-bit sequence received on four address inputs. Prior to entering the 16-bit pattern, which sets the bank switch, a read cycle of 1111 on address inputs AW through AZ should be executed to guarantee that pattern entry starts with bit 0. Each set of address inputs is clocked into the DS1222 when C<sub>EI</sub> is driven low. All 16 inputs must be consecutive read cycles. The first eleven cycles must match the exact bit pattern as shown in Table 1. The last five cycles must match the exact bit pattern as shown for addresses AX, AY, and AZ. However, address line AW defines the bank number to be enabled as per Table 2.

**DALLAS**  
SEMICONDUCTOR

# DS1336

## Afterburner Chip

### FEATURES

- Provides power switching of up to 1.5 amps at voltages between 3.0 and 5.0 volts
- Five separate power switches
- Selectable battery switches for use with battery-backed systems
- Very low on impedance of  $0.7\Omega$
- Battery backup current of 4 mA
- Diode-isolated battery path
- Available in 16-pin DIP or 16-pin SOIC surface mount package
- Low voltage drop battery path
- Connects directly to a variety of Dallas Semiconductor devices, adding increased switching capability for large battery backup current applications

### PIN ASSIGNMENT

OUT5	1	16	V <sub>CC</sub> /IN1
PF	2	15	PF
IN5	3	14	GND
IN2	4	13	OUT1
IN4	5	12	OUT2
VBATIN	6	11	OUT3
VBAT02	7	10	VBAT01
OUT4	8	9	IN3

16-PIN DIP (300 MIL)  
See Mech. Drawings Section

OUT5	1	16	V <sub>CC</sub> /IN1
PF	2	15	PF
IN5	3	14	GND
IN2	4	13	OUT1
IN4	5	12	OUT2
VBATIN	6	11	OUT3
VBAT02	7	10	VBAT01
OUT4	8	9	IN3

16-PIN SOIC (300 MIL)  
See Mech. Drawings Section

### PIN DESCRIPTION

V <sub>CC</sub> /IN1	- +5V Input and Input 1
IN2 – IN5	- Inputs 2 – 5
OUT1 – 5	- Outputs 1 – 5
V <sub>BATIN</sub>	- External Battery Input
V <sub>BAT01</sub>	- Diode Protected Battery Output
V <sub>BAT02</sub>	- Low Voltage Drop Battery Output
PF, PF	- Power Fail Inputs
GND	- Ground

### DESCRIPTION

The DS1336 Afterburner Chip is designed to provide power switching between a primary power supply ( $V_{CC}$ ) and a backup battery power supply ( $V_{BAT}$ ). Five  $V_{CC}$  and two battery paths are provided which can be used individually or in parallel to supply uninterrupted power in applications such as SRAM networks. When used with one of the Dallas power monitoring devices listed in Section 10, Page 119, Table 1, the DS1336 allows a load to be switched from its main power supply  $V_{CC}$  to a battery backup supply when  $V_{CC}$  falls out of tolerance.

ance. A user may selectively tie together any combination of the output pins to provide the desired high current supply, providing up to 300 mA per OUT pin or a maximum of 1.5A. Depending upon the user's backup supply load requirements, either of the  $V_{BAT}$  outputs may be tied to the OUT pins to supply current when  $V_{CC}$  is out of tolerance. The DS1336 switches back to the higher current  $V_{CC}$  from battery current when PF and  $\overline{PF}$  become inactive.

**DALLAS**  
SEMICONDUCTOR

## DS1640/DS1640C Personal Computer Power FET

### FEATURES

- Contains four P channel power FET switches that can each supply over 300 mA @ 0.2 volts drop
- Controlled directly from CMOS or TTL level signals
- Fast switching time of less than 10  $\mu$ s at rated supply current
- 16-pin DIP or 16-pin SOIC surface mount package
- Positive logic signal turns each FET on and ground or low level signal turns each FET off
- Off condition allows less than 50 nA of current flow
- Low control gate capacitance of less than 5 pF
- FET gates can either follow inputs or be latched
- Designed for use with power supplies ranging from +3 to +5 volts

### PIN ASSIGNMENT

IN1	1	16	IN4
GATE1	2	15	GATE4
OUT1	3	14	OUT4
LATCH	4	13	NC
GND	5	12	Vcc
OUT2	6	11	OUT3
GATE2	7	10	GATE3
IN2	8	9	IN3

16-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

IN1	1	16	IN4
GATE1	2	15	GATE4
OUT1	3	14	OUT4
LATCH	4	13	NC
GND	5	12	VCC
OUT2	6	11	OUT3
GATE2	7	10	GATE3
IN2	8	9	IN3

16-PIN SOIC (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

V <sub>CC</sub>	+3 to +5 Volt Input
GND	Ground
IN1-IN4	FET Sources
OUT1-OUT4	FET Drains
GATE1-GATE4	FET Control Gates
NC	No Connection
LATCH	Gate Inputs Latch Control

### DESCRIPTION

The DS1640 contains four P channel power MOS FETs designed as switches to conserve power in personal computer systems. When connected to power management control units, power consuming devices like disk drives or display panel backlights can be routinely shut down to conserve battery or main power supply en-

ergy. The P channel power MOS FETs are individually controlled and are capable of handling 300 mA each continuously with less than 0.2 volts drop from input to output. The device requires a +3 Ü +5-volt power supply input which is used to power internal logic and to operate a gate bias generator.

# TELECOMMUNICATIONS



# DS2141A

## T1 Controller

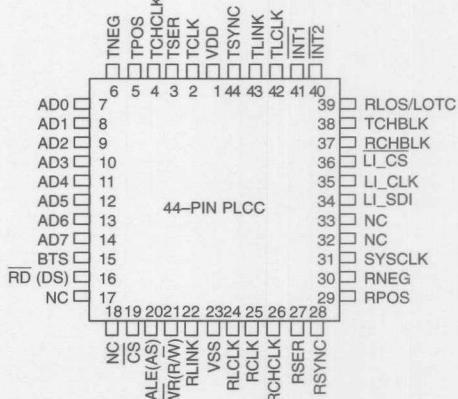
### FEATURES

- DS1/ISDN-PRI framing transceiver
- Frames to D4, ESF, and SLC-96 formats
- Parallel control port
- Onboard, dual two-frame elastic store slip buffers
- Extracts and inserts robbed-bit signaling
- Programmable output clocks
- Onboard FDL support circuitry
- 5V supply; low-power CMOS
- Available in 40-pin DIP and 44-pin PLCC (DS2141Q)
- Compatible with DS2186 Transmit Line Interface, DS2187 Receive Line Interface, DS2188 Jitter Attenuator, DS2290 T1 Isolation Stik, and DS2291 T1 Long Loop Stik.

### PIN ASSIGNMENT

TCLK	1	40	VDD
TSER	2	39	TSYNC
TCHCLK	3	38	TLINK
TPOS	4	37	TLCLK
TNEG	5	36	INT1
AD0	6	35	INT2
AD1	7	34	RLOS/LOTC
AD2	8	33	TCHBLK
AD3	9	32	RCHBLK
AD4	10	31	LI_CS
AD5	11	30	LI_CLK
AD6	12	29	LI_SDI
AD7	13	28	SYSCLK
BTS	14	27	RNEG
RD(DS)	15	26	RPOS
CS	16	25	RSYNC
ALE(A8)	17	24	RSER
WR(R/W)	18	23	RCHCLK
RLINK	19	22	RCLK
VSS	20	21	RLCLK

40-PIN DIP (600 MIL)



### DESCRIPTION

The DS2141A is a comprehensive, software-driven T1 framer. It is meant to act as a slave or coprocessor to a microcontroller or microprocessor. Quick access via the parallel control port allows a single micro to handle many T1 lines. The DS2141A is very flexible and can be configured into numerous orientations via software. The software orientation of the device allows the user to modify their design to conform to future T1 specification changes. The controller contains a set of 62 8-bit internal registers which the user can access. These internal registers are used to configure the device and obtain information from the T1 link. The device fully meets all of the latest T1 specifications including ANSI T1.403-1989, AT&T TR 62411 (12-90), and CCITT G.704 and G.706.

**DALLAS**  
SEMICONDUCTOR

## DS21Q41B Quad T1 Framer

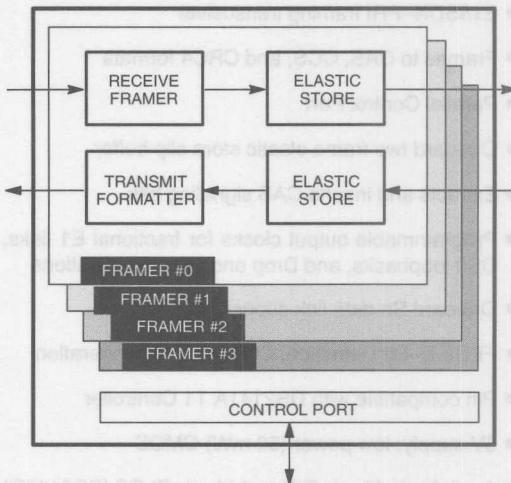
### FEATURES

- Four T1 DS1/ISDN-PRI framing transceivers
- All four framers are fully independent
- Frames to D4, ESF, and SLC-96 formats
- 8-bit parallel control port that can be connected to either multiplexed or non-multiplexed buses
- Each of the four framers contains dual two-frame elastic stores that can connect to asynchronous or synchronous backplanes up to 8.192 MHz
- Extracts and inserts robbed bit signaling
- Framer and payload loopbacks
- Large counters for BPVs, LCVs, EXZs, CRC6, PCVs, F-bit errors and the number of multiframe out of sync
- Contains ANSI ones density monitor and enforcer
- CSU loop code generator and detector
- Programmable output clocks for Fractional T1, ISDN-PRI, Actual Size and per channel loopback applications
- Onboard FDL support circuitry
- Pin compatible with DS21Q43 Quad E1 Framer
- 5V supply; low power CMOS
- Available in 128-pin TQFP
- Industrial (-40°C to +85°C) grade version available (DS21Q41BTN)

### DESCRIPTION

The DS21Q41B combines four of the popular DS2141A T1 Controllers onto a single monolithic die. The "B" designation denotes that some new features are available in the Quad version that were not available in the single T1 device. The added features in the DS21Q41B are listed in Section 1. The DS21Q41B offers a substantial space savings to applications that require more than one T1 framer on a card. The Quad version is only slightly bigger than the single T1 device. All four framers in the DS21Q41B are totally independent; they do

### FUNCTIONAL DIAGRAM



### ACTUAL SIZE



not share a common framing synchronizer. Also, the transmit and receive sides of each framer are totally independent. The dual two-frame elastic stores contained in each of the four framers can be independently enabled and disabled as required. The DS21Q41B meets all of the latest specifications including ANSI T1.403 (and the emerging T1.403-199X), ANSI T1.231-1993, AT&T TR62411, AT&T TR54016, ITU G.704 and G.706.

**DALLAS**  
SEMICONDUCTOR

## DS2143/DS2143Q E1 Controller

### FEATURES

- E1/ISDN-PRI framing transceiver
- Frames to CAS, CCS, and CRC4 formats
- Parallel Control Port
- Onboard two frame elastic store slip buffer
- Extracts and inserts CAS signaling bits
- Programmable output clocks for fractional E1 links, DS0 loopbacks, and Drop and Insert applications
- Onboard Sa data link support circuitry
- FEBE E-Bit Detection, Counting and Generation
- Pin compatible with DS2141A T1 Controller
- 5V supply; low power (50 mW) CMOS
- Available in 40-pin DIP and 44-pin PLCC (DS2143Q)

### PIN ASSIGNMENT

TCLK	1	40	VDD
TSER	2	39	TSYNC
TCHCLK	3	38	TLINK
TPOS	4	37	TLCLK
TNEG	5	36	INT1
AD0	6	35	INT2
AD1	7	34	RLOS/LOTC
AD2	8	33	TCHBLK
AD3	9	32	RCHBLK
AD4	10	31	LI_CS
AD5	11	30	LI_CLK
AD6	12	29	LI_SDI
AD7	13	28	SYSCLK
BTS	14	27	RNEG
RD(DS)	15	26	RPOS
CS	16	25	RSYNC
ALE(AS)	17	24	RSER
WR(R/W)	18	23	RCHCLK
RLINK	19	22	RCLK
VSS	20	21	RLCLK

40-PIN DIP (600 MIL)

### DESCRIPTION

The DS2143 is a comprehensive, software-driven E1 framer. It is meant to act as a slave or coprocessor to a microcontroller or microprocessor. Quick access via the parallel control port allows a single micro to handle many E1 lines. The DS2143 is very flexible and can be configured into numerous orientations via software. The software orientation of the device allows the user to modify their design to conform to future E1 specification changes. The controller contains a set of 69 eight-bit internal registers which the user can access. These internal registers are used to configure the device and obtain information from the E1 link. The device fully meets all of the latest E1 specifications including CCITT G.704, G.706, and G.732.

TNEG	7	6	5	4	3	2	1	44	43	42	41	40	39	RLOS/LOTC
TPOS													38	TCHBLK
TCHCLK													37	RCHBLK
TSER													36	LI_CS
TCLK													35	LI_CLK
VDD													34	LI_SDI
TSYNC													33	NC
TLINK													32	NC
TLCLK													31	SYSCLK
INT1													30	RNEG
INT2													29	RPOS
AD0	7													
AD1	8													
AD2	9													
AD3	10													
AD4	11													
AD5	12													
AD6	13													
AD7	14													
BTS	15													
RD (DS)	16													
CS	17													
ALE(AS)														
WR(R/W)														
RLINK														
VSS														
RCLK														
RLCLK														
RSER														
RSYNC														

44-PIN PLCC

**DALLAS**  
SEMICONDUCTOR

**DS21Q43A**  
Quad E1 Framer

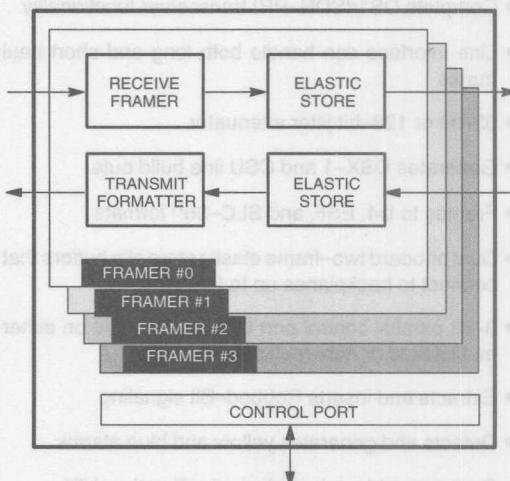
## FEATURES

- Four E1 (CEPT or PCM-30) /ISDN-PRI framing transceivers
- All four framers are fully independent; transmit and receive sections of each framer are fully independent
- Frames to FAS, CAS, CCS, and CRC4 formats
- 8-bit parallel control port that can be connected to either multiplexed or non-multiplexed buses
- Each of the four framers contains dual two-frame elastic stores that can connect to asynchronous or synchronous backplanes up to 8.192 MHz
- Easy access to Si and Sa bits
- Extracts and inserts CAS signaling
- Large counters for bipolar and code violations, CRC4 code word errors, FAS word errors, and E-bits
- Programmable output clocks for Fractional E1, per channel loopback, H0 and H12 applications
- Detects and generates AIS, remote alarm, and remote multiframe alarms
- Pin-compatible with DS21Q41B Quad T1 Framer
- 5V supply; low power CMOS
- Available in 128-pin TQFP
- Industrial (-40°C to +85°C) grade version available (DS21Q43ATN)

## DESCRIPTION

The DS21Q43A combines four of the popular DS2143 E1 Controllers onto a single monolithic die. The "A" designation denotes that some new features are available in the Quad version that were not available in the single E1 device. The added features in the DS21Q43A are listed in Section 1. The DS21Q43A offers a substantial space savings to applications that require more than one E1 framer on a card. The Quad version is only slightly bigger than the single E1 device. All four fram-

## FUNCTIONAL DIAGRAM



## ACTUAL SIZE



ers in the DS21Q43A are totally independent; they do not share a common framing synchronizer. Also, the transmit and receive sides of each framer are totally independent. The dual two-frame elastic stores contained in each of the four framers can be independently enabled and disabled as required. The DS21Q43A meets all of the latest specifications including CCITT/ITU G.704, G.706, G.962, and I.431 as well as ETS 300 011 and ETS 300 233.

**DALLAS**  
SEMICONDUCTOR

# DS2151Q

## T1 Single-Chip Transceiver

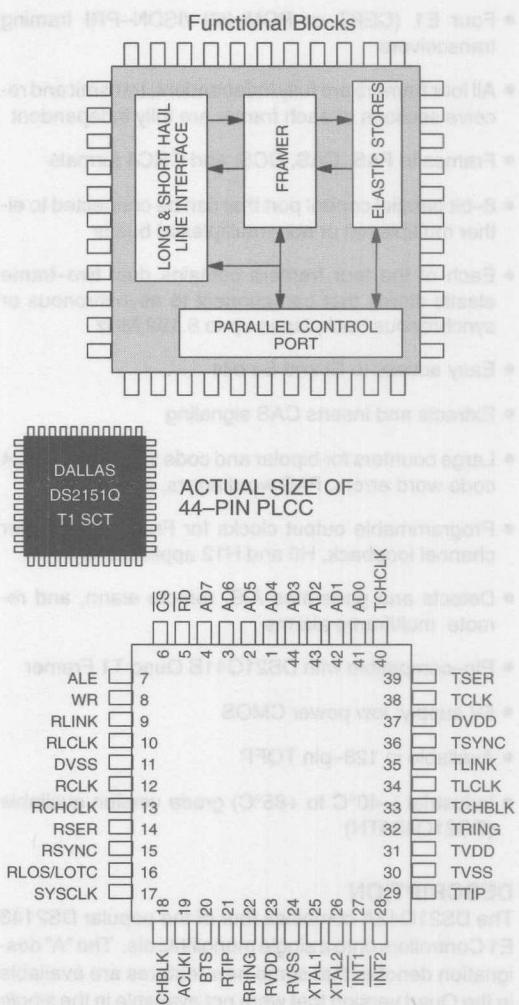
### FEATURES

- Complete DS1/ISDN-PRI transceiver functionality
- Line interface can handle both long and short haul trunks
- 32-bit or 128-bit jitter attenuator
- Generates DSX-1 and CSU line build outs
- Frames to D4, ESF, and SLC-96<sup>R</sup> formats
- Dual onboard two-frame elastic store slip buffers that connect to backplanes up to 8.192 MHz
- 8-bit parallel control port that can be used on either multiplexed or non-multiplexed buses
- Extracts and inserts Robbed-Bit signaling
- Detects and generates yellow and blue alarms
- Programmable output clocks for Fractional T1
- Fully independent transmit and receive functionality
- Onboard FDL support circuitry
- Generates and detects CSU loop codes
- Contains ANSI one's density monitor and enforcer
- Large path and line error counters including BPV, CV, CRC6, and framing bit errors
- Pin compatible with DS2153Q E1 Single-Chip Transceiver
- 5V supply; low power CMOS
- Industrial grade version (-40°C to +85°C) available (DS2151QN)

### DESCRIPTION

The DS2151Q T1 Single-Chip Transceiver (SCT) contains all of the necessary functions for connection to T1 lines whether they be DS-1 long haul or DSX-1 short haul. The clock recovery circuitry automatically adjusts

### PIN ASSIGNMENT





# DS2152 Enhanced T1 Single Chip Transceiver

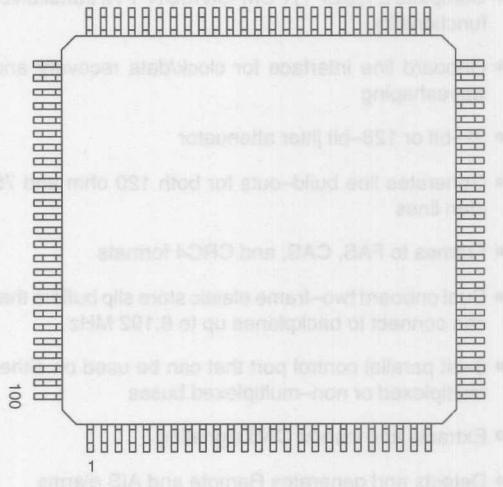
## FEATURES

- Complete DS1/ISDN-PRI transceiver functionality
- Line interface can handle both long and short haul trunks
- 32-bit or 128-bit crystal-less jitter attenuator
- Generates DSX-1 and CSU line build outs
- Frames to D4, ESF, and SLC-96<sup>R</sup> formats
- Dual onboard two-frame elastic store slip buffers that can connect to asynchronous backplanes up to 8.192 MHz
- 8-bit parallel control port that can be used directly on either multiplexed or non-multiplexed buses (Intel or Motorola)
- Extracts and inserts robbed bit signaling
- Detects and generates yellow (RAI) and blue (AIS) alarms
- Programmable output clocks for Fractional T1
- Fully independent transmit and receive functionality
- Integral HDLC controller with 16-byte buffers for the FDL
- Generates and detects in-band loop codes from 1 to 8 bits in length including CSU loop codes
- Contains ANSI one's density monitor and enforcer
- Large path and line error counters including BPV, CV, CRC6, and framing bit errors
- Pin compatible with DS2154 E1 Enhanced Single-Chip Transceiver
- 5V supply; low power CMOS
- 100-pin 14mm<sup>2</sup> body LQFP package

## DESCRIPTION

The DS2152 T1 Enhanced Single-Chip Transceiver contains all of the necessary functions for connection to T1 lines whether they be DS-1 long haul or DSX-1 short haul. The clock recovery circuitry automatically adjusts to T1 lines from 0 feet to over 6000 feet in length. The device can generate both DSX-1 line build outs as well as CSU line build outs of -7.5 dB, -15 dB, and -22.5 dB. The onboard jitter attenuator (selectable to either 32 bits or 128 bits) can be placed in either the transmit or receive data paths. The framer locates the frame and multiframe boundaries and monitors the data stream for

## PIN ASSIGNMENT



## ORDERING INFORMATION

DS2152L	(0°C to 70°C)
DS2152LN	(-40°C to +85°C)

**DALLAS**  
SEMICONDUCTOR

**DS2153Q**  
E1 Single-Chip Transceiver

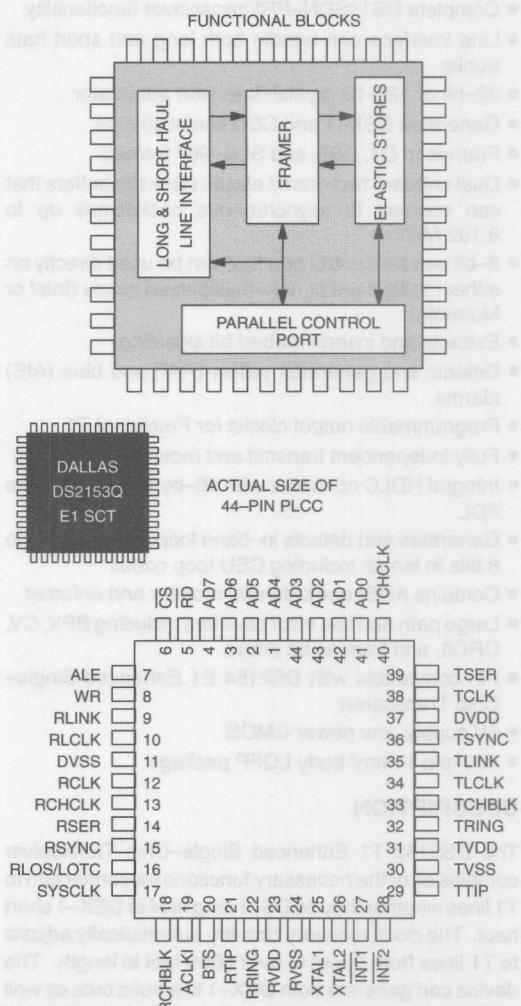
## FEATURES

- Complete E1(CEPT) PCM-30/ISDN-PRI transceiver functionality
- Onboard line interface for clock/data recovery and waveshaping
- 32-bit or 128-bit jitter attenuator
- Generates line build-outs for both 120 ohm and 75 ohm lines
- Frames to FAS, CAS, and CRC4 formats
- Dual onboard two-frame elastic store slip buffers that can connect to backplanes up to 8.192 MHz
- 8-bit parallel control port that can be used on either multiplexed or non-multiplexed buses
- Extracts and inserts CAS signaling
- Detects and generates Remote and AIS alarms
- Programmable output clocks for Fractional E1, H0, and H12 applications
- Fully independent transmit and receive functionality
- Full access to both Si and Sa bits
- Three separate loopbacks for testing
- Large counters for bipolar and code violations, CRC4 code word errors, FAS errors, and E bits
- Pin compatible with DS2151Q T1 Single-Chip Transceiver
- 5V supply; low power CMOS
- Industrial grade version (-40°C to +85°C) available (DS2153QN)

## DESCRIPTION

The DS2153Q T1 Single-Chip Transceiver (SCT) contains all of the necessary functions for connection to E1 lines. The onboard clock/data recovery circuitry converts the AMI/HDB3 E1 waveforms to a NRZ serial stream.

## PIN ASSIGNMENT



The DS2153 automatically adjusts to E1 22 AWG (0.6 mm) twisted-pair cables from 0 to 1.5 KM. The device can generate the necessary G.703 waveshapes for both 75 ohm and 120 ohm cables.

**DALLAS**  
SEMICONDUCTOR

# DS2154

## Enhanced E1 Single Chip Transceiver

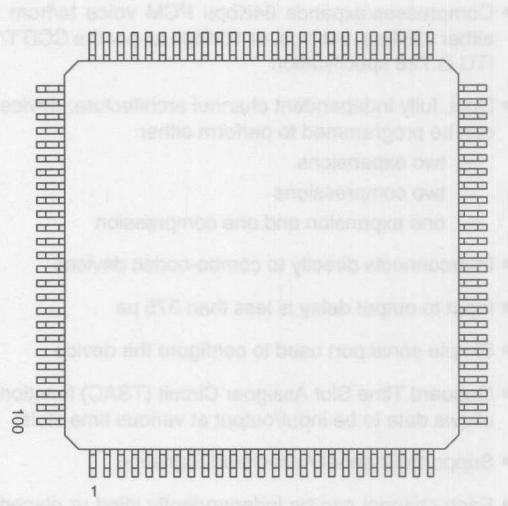
### FEATURES

- Complete E1(CEPT) PCM-30/ISDN-PRI transceiver functionality
- Onboard long and short haul line interface for clock/data recovery and waveshaping
- 32-bit or 128-bit crystal-less jitter attenuator
- Generates line build outs for both 120Ω and 75Ω lines
- Frames to FAS, CAS, and CRC4 formats
- Dual onboard two-frame elastic store slip buffers that can connect to asynchronous backplanes up to 8.192 MHz
- 8-bit parallel control port that can be used directly on either multiplexed or non-multiplexed buses
- Extracts and inserts CAS signaling
- Detects and generates Remote and AIS alarms
- Programmable output clocks for Fractional E1, H0, and H12 applications
- Fully independent transmit and receive functionality
- Full access to both Si and Sa bits aligned with CRC multiframe
- Four separate loopbacks for testing functions
- Large counters for bipolar and code violations, CRC4 codeword errors, FAS errors, and E bits
- Pin compatible with DS2152 T1 Enhanced Single-Chip Transceiver
- 5V supply; low power CMOS
- 100-pin 14mm<sup>2</sup> body LQFP package

### DESCRIPTION

The DS2154 Enhanced Single-Chip Transceiver (ESCT) contains all of the necessary functions for connection to E1 lines. The device is an upward compatible version of the DS2153 Single-Chip Transceiver. The onboard clock/data recovery circuitry converts the AMI/HDB3 E1 waveforms to a NRZ serial stream. The DS2154 automatically adjusts to E1 22AWG (0.6 mm) twisted-pair cables from 0 to over 2km in length. The device can generate the necessary G.703 waveshapes for both 75 ohm coax and 120 ohm twisted cables. The onboard jitter attenuator (selectable to either 32 bits or 128 bits) can be placed in either the transmit or receive

### PACKAGE OUTLINE



### ORDERING INFORMATION

DS2154L	(0°C to 70°C)
DS2154LN	(-40°C to +85°C)

data paths. The framer locates the frame and multi-frame boundaries and monitors the data stream for alarms. It is also used for extracting and inserting signaling data, Si, and Sa bit information. The device contains a set of internal registers which the user can access to control the operation of the unit. Quick access via the parallel control port allows a single controller to handle many E1 lines. The device fully meets all of the latest E1 specifications including ITU G.703, G.704, G.706, G.823, G.932, and I.431 as well as ETS 300 011, 300 233, 300 166, TBR 12 and TBR 13.

**DALLAS**  
SEMICONDUCTOR

**DS2164Q**  
G.726 ADPCM Processor

## FEATURES

- Compresses/expands 64Kbps PCM voice to/from either 32Kbps, 24Kbps, or 16Kbps as per the CCITT/ITU G.726 specification
- Dual, fully independent channel architecture; device can be programmed to perform either:
  - two expansions
  - two compressions
  - one expansion and one compression
- Interconnects directly to combo-codec devices
- Input to output delay is less than 375 µs
- Simple serial port used to configure the device
- Onboard Time Slot Assigner Circuit (TSAC) function allows data to be input/output at various time slots
- Supports Channel Associated Signaling
- Each channel can be independently idled or placed into bypass
- Available hardware mode requires no host processor; ideal for voice storage applications
- Backward-compatible with the DS2165 ADPCM Processor Chip
- Single +5V supply; low-power CMOS technology
- Available in 28-pin PLCC

## DESCRIPTION

The DS2164Q ADPCM Processor Chip is a dedicated Digital Signal Processing (DSP) chip that has been optimized to perform Adaptive Differential Pulse Code Modulation (ADPCM) speech compression at three different rates. The chip can be programmed to compress (expand) 64Kbps voice data down to (up from) either 32Kbps, 24Kbps, or 16Kbps. The compression follows the algorithm specified by CCITT Recommendation G.726. The DS2164Q can switch compression algorithms on-the-fly. This allows the user to make maximum use of the available bandwidth on a dynamic basis.

## PIN ASSIGNMENT

	TM1	TMO	RST	NC	VDD	YIN	CLKY	
NC	5	4	3	2	1	28	27	26
A0	6						24	FSY
A1		7					23	YOUT
A2			8				22	CS
A3				9			21	SDI
A4					10		20	SCLK
A5						11	19	XOUT
SPS	12	13	14	15	16	17	18	NC
MCLK								NC
VSS								
NC								
XIN								
CLKX								
FSX								

28-Pin PLCC

## OVERVIEW

The DS2164Q contains three major functional blocks: a high performance (10 MIPS) DSP engine, two independent PCM interfaces (X and Y) which connect directly to serial Time Division Multiplexed (TDM) backplanes, and a serial port that can configure the device on-the-fly via an external controller. A 10 MHz master clock is required by the DSP engine. The DS2164Q can be configured to perform either two expansions, two compressions, or one expansion and one compression. The PCM/ADPCM data interfaces support data rates from 256 KHz to 4.096 MHz.

**DALLAS**  
SEMICONDUCTOR

# DS2165/DS2165Q

## 16/24/32Kbps ADPCM Processor

### FEATURES

- Compresses/expands 64Kbps PCM voice to/from either 32Kbps, 24Kbps, or 16Kbps
- Dual, fully independent channel architecture; device can be programmed to perform either:
  - two expansions
  - two compressions
  - one expansion and one compression
- Interconnects directly to combo-codec devices
- Input to output delay is less than 375  $\mu$ s
- Simple serial port used to configure the device
- Onboard Time Slot Assigner Circuit (TSAC) function allows data to be input/output at various time slots
- Supports Channel Associated Signaling
- Each channel can be independently idled or placed into bypass
- Available hardware mode requires no host processor; ideal for voice storage applications
- Backward-compatible with the DS2167 ADPCM Processor Chip
- Single +5V supply; low-power CMOS technology
- Available in 24-pin DIP and 28-pin PLCC

### PIN ASSIGNMENT

RST	1	24	VDD
TMO	2	23	YIN
TM1	3	22	CLKY
A0	4	21	FSY
A1	5	20	YOUT
A2	6	19	CS
A3	7	18	SDI
A4	8	17	SCLK
A5	9	16	XOUT
SPS	10	15	FSX
MCLK	11	14	CLKX
VSS	12	13	XIN

24-Pin DIP (600 MIL)

	TMI	TMO	RST	NC	VDD	YIN	CLKY
NC	5	4	3	2	1	28	27
A0	6					24	YOUT
A1	7					23	CS
A2	8					22	SDI
A3	9					21	SCLK
A4	10					20	XOUT
A5	11					19	NC
SPS	12	13	14	15	16	17	18
MCLK							CLKX
VSS							FSX

28-Pin PLCC

A 3-volt Operation Version  
is Available (DS2165QL)

### DESCRIPTION

The DS2165 ADPCM Processor Chip is a dedicated Digital Signal Processing (DSP) chip that has been optimized to perform Adaptive Differential Pulse Code Modulation (ADPCM) speech compression at three different rates. The chip can be programmed to compress (expand) 64Kbps voice data down to (up from) either 32Kbps, 24Kbps, or 16Kbps. The compression to 32Kbps follows the algorithm specified by CCITT Rec-

ommendation G.721 (July 1986) and ANSI document T1.301 (April 1987). The compression to 24Kbps follows ANSI document T1.303. The compression to 16Kbps follows a proprietary algorithm developed by Dallas Semiconductor. The DS2165 can switch compression algorithms on-the-fly. This allows the user to make maximum use of the available bandwidth on a dynamic basis.

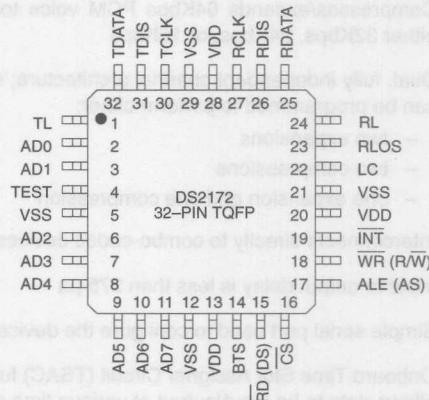
**DALLAS**  
SEMICONDUCTOR

## DS2172 Bit Error Rate Tester (BERT)

### FEATURES

- Generates/Detects digital bit patterns for analyzing, evaluating and troubleshooting digital communications systems
- Operates at speeds from DC to 52 MHz
- Programmable polynomial length and feedback taps for generation of any other pseudorandom pattern up to 32 bits in length including:  $2^6-1$ ,  $2^9-1$ ,  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ , and  $2^{32}-1$
- Programmable user-defined pattern and length for generation of any repetitive pattern up to 32 bits in length
- Large 32-bit error count and bit count registers
- Software programmable bit error insertion
- Fully independent transmit and receive sections
- 8-bit parallel control port
- Detects test patterns with bit error rates up to  $10^{-2}$

### PIN ASSIGNMENT



### DESCRIPTION

The DS2172 Bit Error Rate Tester (BERT) is a software programmable test pattern generator, receiver, and analyzer capable of meeting the most stringent error performance requirements of digital transmission facilities. Two categories of test pattern generation (Pseudorandom and Repetitive) conform to CCITT/ITU O.151, O.152, O.153, and O.161 standards. The DS2172 operates at clock rates ranging from DC to 52 MHz. This wide range of operating frequency allows the DS2172 to be used in existing and future test equipment, transmission facilities, switching equipment, multiplexers, DACs, Routers, Bridges, CSUs, DSUs, and CPE equipment.

The DS2172 user programmable pattern registers provide the unique ability to generate loopback patterns required for T1, Fractional-T1, Smart Jack, and other

test procedures. Hence the DS2172 can initiate the loopback, run the test, check for errors, and finally deactivate the loopback.

The DS2172 consists of four functional blocks: the pattern generator, pattern detector, error counter, and control interface. The DS2172 can be programmed to generate any pseudorandom pattern with length up to  $2^{32}-1$  bits (See Table 5, Note 9) or any user programmable bit pattern from 1 to 32 bits in length. Logic inputs can be used to configure the DS2172 for applications requiring gap clocking such as Fractional-T1, Switched-56, DDS, normal framing requirements, and per-channel test procedures. In addition, the DS2172 can insert single or  $10^{-1}$  to  $10^{-7}$  bit errors to verify equipment operation and connectivity.

**DALLAS**  
SEMICONDUCTOR

**DS2175**  
T1/CEPT Elastic Store

## FEATURES

- Rate buffer for T1 and CEPT transmission systems
- Synchronizes loop-timed and system timed data streams on frame boundaries
- Ideal for T1 (1.544 MHz) to CEPT (2.048 MHz), CEPT to T1 interfaces
- Supports parallel and serial backplanes
- Buffer depth is 2 frames
- Comprehensive on-chip "slip" control logic
  - Slips occur only on frame boundaries
  - Outputs report slip occurrences and direction
  - Align feature allows buffer to be recentered at any time
  - Buffer depth easily monitored
- Compatible with DS2180A T1 and DS2181A CEPT Transceivers
- Industrial temperature range of -40°C to +85°C available, designated DS2175N



## DESCRIPTION

The DS2175 is a low-power CMOS elastic-store memory optimized for use in primary rate telecommunications transmission equipment. The device serves as a synchronizing element between async data streams and is compatible with North American (T1-1.544 MHz) and European (CEPT-2.048 MHz) rate networks. The chip has several flexible operating

## PIN ASSIGNMENT

RCLKSEL	1	16	VDD
RCLK	2	15	SYSCLK
RSER	3	14	SSER
RMSYNC	4	13	SMSYNC
FSD	5	12	SFSYNC
SLIP	6	11	SCHCLK
ALN	7	10	S/P
VSS	8	9	SCLKSEL

16-PIN DIP (300 MIL)

16-PIN SOIC (300 MIL)

modes which eliminate support logic and hardware currently required to interconnect parallel or serial TDM backplanes. Application areas include digital trunks, drop and insert equipment, digital cross-connects (DACS), private network equipment and PABX-to-computer interfaces such as DMI and CPI.

**DALLAS**  
SEMICONDUCTOR

# DS2176

## T1 Receive Buffer

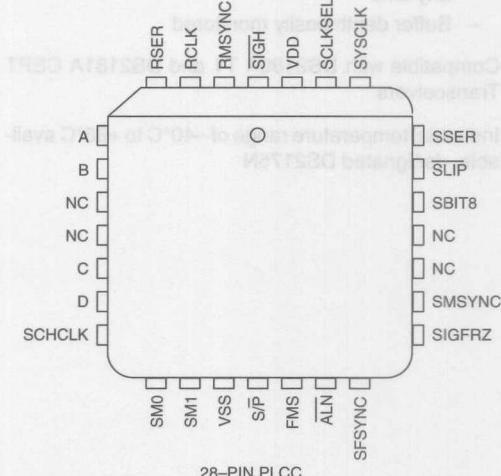
### FEATURES

- Synchronizes loop-timed and system-timed T1 data streams
- Two-frame buffer depth; slips occur on frame boundaries
- Output indicates when slip occurs
- Buffer may be recentered externally
- Ideal for 1.544 to 2.048 MHz rate conversion
- Interfaces to parallel or serial backplanes
- Extracts and buffers robbed-bit signalling
- Inhibits signalling updates during alarm or slip conditions
- Integration feature "debounces" signalling
- Slip-compensated output indicates when signalling updates occur
- Compatible with DS2180A T1 Transceiver
- Surface mount package available, designated DS2176Q
- Industrial temperature range of -40°C to +85°C available, designated DS2176N

### PIN ASSIGNMENT

SIGH	1	24	VDD
RMSYNC	2	23	SCLKSEL
RCLK	3	22	SYSCLK
RSER	4	21	SSER
A	5	20	SLIP
B	6	19	SBIT8
C	7	18	SMSYNC
D	8	17	SIGFRZ
SCHCLK	9	16	SFSYNC
SM0	10	15	ALN
SM1	11	14	FMS
VSS	12	13	S/P

24-PIN 300 MIL DIP



### DESCRIPTION

The DS2176 is a low-power CMOS device specifically designed for synchronizing receive side loop-timed T-carrier data streams with system side timing. The device has several flexible operating modes which simplify interfacing incoming data to parallel and serial TDM backplanes. The device extracts, buffers and integrates ABCD signalling; signalling updates are prohibited dur-

ing alarm or slip conditions. The buffer replaces extensive hardware in existing applications with one "skinny" 24-lead package. Application areas include digital trunks, drop and insert equipment, transcoders, digital cross-connects (DACS), private network equipment and PABX-to-computer interfaces such as DMI and CPI.

**DALLAS**  
SEMICONDUCTOR

**DS2180A**  
T1 Transceiver

## FEATURES

- Single chip DS1 rate transceiver
- Supports common framing standards
  - 12 frames/superframe "193S"
  - 24 frames/superframe "193E"
- Three zero suppression modes
  - B7 stuffing
  - B8ZS
  - Transparent
- Simple serial interface used for configuration, control and status monitoring in "processor" mode
- "Hardware" mode requires no host processor; intended for stand-alone applications
- Selectable 0, 2, 4, 16 state robbed bit signaling modes
- Allows mix of "clear" and "non-clear" DS0 channels on same DS1 link
- Alarm generation and detection
- Receive error detection and counting for transmission performance monitoring
- 5V supply, low-power CMOS technology
- Surface mount package available, designated DS2180AQ
- Industrial temperature range of -40°C to +85°C available, designated DS2180AN or DS2180AQN
- Compatible to DS2186 Transmit Line Interface, DS2187 Receive Line Interface, DS2188 Jitter Attenuator, DS2175 T1/CEPT Elastic Store, DS2290 T1 Isolation Stik, and DS2291 T1 Long Loop Stik

## DESCRIPTION

The DS2180A is a monolithic CMOS device designed to implement primary rate (1.544 MHz) T-carrier transmission systems. The 193S framing mode is intended to support existing Ft/Fs applications (12 frames/superframe). The 193E framing mode supports the extended superframe format (24 frames/superframe). Clear channel capability is provided by selection of appropriate zero suppression and signaling modes.

## PIN ASSIGNMENT

TMSYNC	1	40	VDD
TFSYNC	2	39	RLOS
TCLK	3	38	RFER
TCHCLK	4	37	RBV
TSER	5	36	RCL
TMO	6	35	RNEG
TSIGSEL	7	34	RPOS
TSIGFR	8	33	RST
TABCD	9	32	TEST
TLINK	10	31	RSIGSEL
TLCLK	11	30	RSIGFR
TPOS	12	29	RABCD
TNEG	13	28	RMSYNC
INT	14	27	RFSYNC
SDI	15	26	RSER
SDO	16	25	RCHCLK
CS	17	24	RCLK
SCLK	18	23	RLCLK
SPS	19	22	RLINK
VSS	20	21	RYEL

40-Pin DIP (600 MIL)

TSER	7	NC	39	RNEG
TMO	8	NC	38	RPOS
TSIGSEL	9	NC	37	RST
TSIGFR	10	NC	36	TEST
TABCD	11	NC	35	RSIGSEL
TLINK	12	44-PIN PLCC	34	RSIGFR
TLCLK	13	NC	33	RABCD
TPOS	14	NC	32	RMSYNC
TNEG	15	NC	31	RFSYNC
INT	16	NC	30	RSER
SDI	17	NC	29	RCHCLK
SDO	18	SCLK	28	NC
CS	19	SPS	27	NC
	20	VSS	26	RLCLK
	21	RYEL	25	RLINK
	22	NC	24	NC
	23	NC	23	NC
	24	NC	22	NC
	25	NC	21	NC
	26	NC	20	NC
	27	NC	19	NC

**DALLAS**  
SEMICONDUCTOR

**DS2181A**  
CEPT Primary Rate Transceiver

## FEATURES

- Single-chip primary rate transceiver meets CCITT standards G.704, G.706 and G.732
- Supports new CRC4-based framing standards and CAS and CCS signalling standards
- Simple serial interface used for device configuration and control in processor mode
- Hardware mode requires no host processor; intended for stand-alone applications
- Comprehensive, on-chip alarm generation, alarm detection, and error logging logic
- Shares footprint with DS2180A T1 Transceiver
- Companion to DS2175 T1/CEPT Elastic Store, DS2186 Transmit Line Interface, DS2187 Receive Line Interface, and DS2188 Jitter Attenuator
- 5V supply; low-power CMOS technology

## DESCRIPTION

The DS2181A is designed for use in CEPT networks and supports all logical requirements of CCITT Red Book Recommendations G.704, G.706 and G.732. The transmit side generates framing patterns and CRC4 codes, formats outgoing channel and signalling data, and produces network alarm codes when enabled. The receive side decodes the incoming data and establishes frame, CAS multiframe, and CRC4 multiframe alignments. Once synchronized, the device extracts channel, signalling, and alarm data.

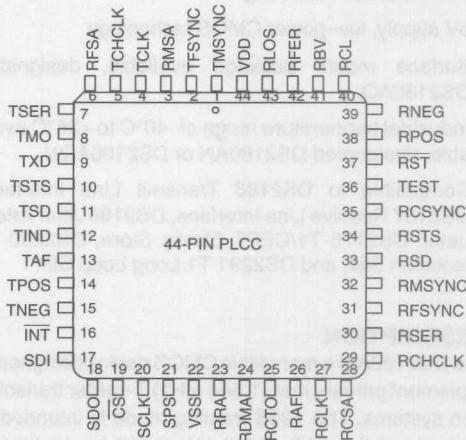
A serial port allows access to 14 on-chip control and status registers in the processor mode. In this mode, a host processor controls features such as error logging, per-channel code manipulation, and alteration of the receive synchronizer algorithm.

The hardware mode is intended for preliminary system prototyping and/or retrofitting into existing systems. This mode requires no host processor and disables special features available in the processor mode.

## PIN ASSIGNMENT

TMSYNC	1	40	VDD
TFSYNC	2	39	RLOS
TCLK	3	38	RFER
TCHCLK	4	37	RBV
TSER	5	36	RCL
TMO	6	35	RNEG
TXD	7	34	RPOS
TSTS	8	33	RST
TSD	9	32	TEST
TIND	10	31	RCSYNC
TAF	11	30	RSTS
TPOS	12	29	RSD
TNEG	13	28	RMSYNC
INT	14	27	RFSYNC
SDI	15	26	RSER
SDO	16	25	RCHCLK
CS	17	24	RCLK
SCLK	18	23	RAF
SPS	19	22	RDMA
VSS	20	21	RRA

40-Pin DIP (600 MIL)



**DALLAS**  
SEMICONDUCTOR

**DS2182A**  
T1 Line Monitor

## FEATURES

- Performs framing and monitoring functions
- Supports Superframe and Extended Superframe formats
- Four onboard error counters
  - 16-bit bipolar violation
  - 8-bit CRC
  - 8-bit OOF
  - 8-bit frame bit error
- Indication of the following
  - yellow and blue alarms
  - incoming B8ZS code words
  - 8 and 16 zero strings
  - change of frame alignment
  - loss of sync
  - carrier loss
- Simple serial interface used for configuration, control and status monitoring
- Burst mode allows quick access to counters for status updates
- Automatic counter reset feature
- Single 5V supply; low-power CMOS technology
- Available in 28-pin DIP and 28-pin PLCC
- The DS2182A is upward-compatible from the original DS2182

## PIN ASSIGNMENT

INT	1	28	VDD
SDI	2	27	RLOS
SDO	3	26	RFER
CS	4	25	RBV
SCLK	5	24	RCL
NC	6	23	RNEG
RYEL	7	22	RPOS
RLINK	8	21	RST
RLCLK	9	20	TEST
RCLK	10	19	RSIGSEL
RCHCLK	11	18	RSIGFR
RSER	12	17	RABCD
NC	13	16	RMSYNC
VSS	14	15	RFSYNC

28-Pin DIP (600 MIL)

The updated DS2182A includes the following changes from the original DS2182:

- ability to count excessive zeros
- Severely Errored Framing Event indication
- updated AIS detection
- updated RCL detection
- AIS and RCL alarm clear indications

## DESCRIPTION

The DS2182A T1 Line Monitor Chip is a monolithic CMOS device designed to monitor real-time performance on T1 lines. The DS2182A frames to the data on the line, counts errors, and supplies detailed information about the status and condition of the line. Large onboard counters allow the accumulation of errors for ex-

tended periods, which permits a single CPU to monitor a number of T1 lines. Output clocks that are synchronized to the incoming data stream are provided for easy extraction of S-Bits, FDL bits, signaling bits, and channel data. The DS2182A meets the requirements of ANSI T1.231.

**DALLAS**  
SEMICONDUCTOR

# DS2187

## Receive Line Interface

### FEATURES

- Line interface for T1 (1.544 MHz) and CEPT (2.048 MHz) primary rate networks
- Extracts clock and data from twisted pair or coax
- Meets requirements of PUB 43801, TR 62411, and applicable CCITT G.823
- Precision on-chip PLL eliminates external crystal or LC tank - no tuning required
- Decodes AMI, B8ZS, and HDB3 coded signals
- Designed for short loop applications such as terminal equipment to DSX-1
- Reports alarm and error events
- Compatible with the DS2180A T1/ISDN Primary Rate and DS2181A CEPT Transceivers, as well as DS2141A T1 and DS2143 E1 Controllers
- Companion to the DS2186 T1/CEPT Transmit Line Interface and DS2188 T1/CEPT Jitter Attenuator
- Single 5V supply; low-power CMOS technology

### PIN ASSIGNMENT

AVDD	1	20	DVDD
RAIS	2	19	RCL
ZCSEN	3	18	AIS
NC	4	17	BPV
LCAP	5	16	NC
RCLKSEL	6	15	NC
RTIP	7	14	RPOS
RRING	8	13	RNEG
LOCK	9	12	RCLK
AVSS	10	11	DVSS

20-Pin SOIC (300 Mil)

AVDD	1	18	DVDD
RAIS	2	17	RCL
ZCSEN	3	16	AIS
LCAP	4	15	BPV
RCLKSEL	5	14	NC
RTIP	6	13	RPOS
RRING	7	12	RNEG
LOCK	8	11	RCLK
AVSS	9	10	DVSS

18-Pin DIP (300 Mil)

### DESCRIPTION

The DS2187 T1/CEPT Receive Line Interface Chip interfaces user equipment to North American (T1 1.544 MHz) and European (CEPT 2.048 MHz) primary rate communication networks. The device extracts clock and data from twisted pair or coax transmission media and eliminates expensive discrete components and/or

manual tuning required in existing T1 and CEPT line termination electronics.

Application areas include DACS, CSU, CPE, channel banks, and PABX-to-computer interfaces such as DMI and CPI.

**DALLAS**  
SEMICONDUCTOR

**DS2188**  
T1/CEPT Jitter Attenuator

**FEATURES**

- Attenuates clock and data jitter present in T1 or CEPT lines
- Meets the jitter attenuation templates outlined in TR62411, TR-TSY-000170, G.735, and G.742
- Only one external component required; either a 6.176 MHz (T1) or 8.192 MHz (CEPT) crystal
- Selectable buffer size of 128 or 32 bits
- Jitter attenuation is easily disabled
- Single +5V supply; low-power CMOS technology
- Available in 16-pin DIP and 16-pin SOIC (DS2188S)
- Companion to the DS2186 Transmit Line and DS2187 Receive Line Interfaces

**PIN ASSIGNMENT**

DJA	1	16	VDD
RPOS	2	15	RRPOS
RNEG	3	14	RRNEG
RCLK	4	13	RRCLK
BDS	5	12	RST
TEST	6	11	BL
XTAL OUT	7	10	XTAL2
VSS	8	9	XTAL1

16-PIN DIP/SOIC

**DESCRIPTION**

The DS2188 T1/CEPT Jitter Attenuator Chip contains a 128 X 2-bit buffer which, in conjunction with an external 4X crystal, is used to attenuate the incoming jitter present in clock and data. The device meets all of the latest applicable specifications including those outlined in TR 62411 (Accunet\* T1.5 Service Description and Interface Specifications, December 1990), TR-TSY-000170 (Digital Cross-Connect System Requirements and Ob-

jectives, November 1985), and the CCITT Recommendations G.735 and G.742. The DS2188 is compatible with the DS2180A T1/ISDN Primary Rate Transceiver and DS2181A CEPT Transceiver and it is the companion to the DS2187 T1/CEPT Receive Line Interface and DS2186 T1/CEPT Transmit Line Interface. It can also be used in conjunction with the DS2190 T1 Network Interface Unit.

\* Service mark of AT&T Communications





**DALLAS**  
SEMICONDUCTOR

## DS21T05

### SCSI Terminator

#### FEATURES

- Fully compliant with SCSI-1, Fast SCSI and Ultra SCSI
- Functionally compatible to the DS21T07, targeted for high volume applications
- Provides active termination for nine signal lines
- Laser-trimmed 110 ohm termination resistors have 5% tolerance
- Low dropout voltage
- Power-down mode isolates termination resistors from the bus
- SCSI bus hot-plug compatible
- Fully supports actively negated SCSI signals
- Onboard thermal shutdown circuitry
- 16-pin plastic narrow SOIC

#### PIN ASSIGNMENT

TERMPWR1	1	16	PD
R1	2	15	VREF2
R2	3	14	R9
R3	4	13	R8
R4	5	12	R7
R5	6	11	R6
VREF1	7	10	NC
GND	8	9	TERMPWR2

DS21T05Z 16-PIN SOIC (150 MIL)

TERMPWR1	1	16	PD
R1	2	15	VREF2
R2	3	14	NC
R3	4	13	R9
R4	5	12	R8
R5	6	11	R7
VREF1	7	10	R6
GND	8	9	TERMPWR2

DS21T05S 16-PIN SOIC (300 MIL)

#### DESCRIPTION

Fast SCSI and Ultra SCSI require the use of active terminations at both ends of every cable segment in a SCSI system with single-ended drivers and receivers. The DS21T05 SCSI Terminator, which is fully compliant with these standards, enables the designer to gain the benefits of active termination: greater immunity to voltage drops on the TERMPWR (TERMinator PoWeR) line, enhanced high-level noise immunity, intrinsic

TERMPWR decoupling, and very low quiescent current consumption. The DS21T05, which integrates a regulator and nine precise switched 110 ohm termination resistors into a monolithic IC, is a functionally compatible version of the DS21T07. With relaxed output current and termination tolerances, the DS21T05 is intended for high volume applications which require active termination but not the high performance of the DS21T07.

**DALLAS**  
SEMICONDUCTOR

**DS21T06**  
SCSI Terminator

## FEATURES

- Fully compliant with SCSI-1, Fast SCSI and Ultra SCSI
- Functional drop in replacement for the DS2106
- Complimentary part to DS21T07 for wide SCSI
- Provides active termination for 18 signal lines
- 5% tolerance on termination resistors and voltage regulator
- 5% tolerance on termination current
- Low power down capacitance of 3 pF
- Onboard thermal shutdown circuitry
- SCSI bus hot plug compatible
- Fully supports actively negated SCSI signals

## PIN ASSIGNMENT

PD	1	28	GND
R1	2	27	R18
R2	3	26	R17
R3	4	25	R16
R4	5	24	R15
R5	6	23	R14
HS-GND	7	22	NC
HS-GND	8	21	HS-GND
NC	9	20	NC
R6	10	19	R13
R7	11	18	R12
R8	12	17	R11
R9	13	16	R10
TPWR	14	15	V <sub>REF</sub>

DS21T06S 28-PIN SOIC (300 MIL)

## DESCRIPTION

Fast SCSI and Ultra SCSI require the use of active terminations at both ends of every cable segment in a SCSI system with single-ended drivers and receivers. Ultra SCSI requires support of active negation and hot plugging. The DS21T06 is fully compliant with these standards.

The DS21T06 integrates a low dropout regulator and 18 precise switched 110 ohms termination resistors into a 28-pin 300 mil SOIC package.

The DS21T06 is designed to be used with the DS2107 SCSI Terminator. The DS2107 is a 28-pin 300 mil SOIC package that contains a SCSI controller and termination logic. The DS21T06 provides active termination for the SCSI bus, while the DS2107 provides the logic and control for the SCSI bus. The two parts work together to provide a complete SCSI termination solution.

# DALLAS

## SEMICONDUCTOR

# DS21T07

## SCSI Terminator

### FEATURES

- Fully compliant with SCSI-1, Fast SCSI and Ultra SCSI
- Backward compatible to the DS2107, DS2107A, and DS21S07
- Provides active termination for nine signal lines
- Laser-trimmed 110 ohms termination resistors have 2% tolerance
- Low dropout voltage regulator
- Power-down mode isolates termination resistors from the bus
- SCSI bus hot-plug compatible
- Fully supports actively negated SCSI signals
- Onboard thermal shutdown circuitry
- 16-pin plastic SOIC (DS21T07S) and 20-pin plastic TSSOP (Thin Shrink Small Outline Package) (DS21T07E)

### PIN ASSIGNMENT

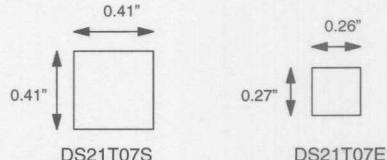
TERMPWR1	1	16	PD
R1	2	15	VREF2
R2	3	14	NC
R3	4	13	R9
R4	5	12	R8
R5	6	11	R7
VREF1	7	10	R6
GND	8	9	TERMPWR2

DS21T07S 16-PIN SOIC (300 MIL)

TERMPWR1	1	20	PD
HS-GND	2	19	VREF2
R1	3	18	HS-GND
R2	4	17	NC
R3	5	16	R9
R4	6	15	R8
R5	7	14	R7
HS-GND	8	13	R6
VREF1	9	12	HS-GND
GND	10	11	TERMPWR2

DS21T07E 20-PIN TSSOP (173 MIL)

### ACTUAL FOOTPRINT SIZE



### DESCRIPTION

Fast SCSI and Ultra SCSI require the use of active terminations at both ends of every cable segment in a SCSI system with single-ended drivers and receivers. The DS21T07 SCSI Terminator, which is fully compliant with these standards, enables the designer to gain the benefits of active termination: greater immunity to voltage drops on the TERMPWR (TERmination PoWeR)

line, enhanced high-level noise immunity, intrinsic TERMPWR decoupling, and very low quiescent current consumption. The DS21T07 integrates a regulator and nine precise switched 110 ohms termination resistors into a monolithic IC. The DS21T07 can be electrically isolated from the SCSI bus without physical removal from the SCSI device.

**DALLAS**  
SEMICONDUCTOR

## DS21T09

### Plug and Play SCSI Terminator

#### FEATURES

- Fully compliant with SCSI-1, Fast SCSI and Ultra SCSI
- Compatible with Plug and Play SCSI Profile
- Functional drop-in replacement for the DS2109
- Complementary part to DS21T07 for wide SCSI
- Provides active termination for 18 signal lines
- 2% tolerance on termination resistors and voltage regulator
- Bus termination sensing
- Low power down capacitance of 3 pF
- Onboard thermal shutdown circuitry

#### PIN ASSIGNMENT

PDI	1	28	GND
R1	2	27	R18
R2	3	26	R17
R3	4	25	R16
R4	5	24	R15
R5	6	23	R14
HS-GND	7	22	TCS
HS-GND	8	21	HS-GND
PDO	9	20	PDE
R6	10	19	R13
R7	11	18	R12
R8	12	17	R11
R9	13	16	R10
TPWR	14	15	V <sub>REF</sub>

DS21T09S 28-PIN SOIC (300 MIL)

The DS21T09 is intended for one chip Plug and Play (PnP) SCSI termination. The DS21T09 is fully compatible with the SCSI-1, Fast SCSI and Ultra SCSI profiles. It provides active termination for 18 signal lines. The DS21T09 is designed to provide high immunity to voltage drops on the SCSI bus. It features a low drop-out regulator, 18 precise, switched 110Ω termination resistors, and bus termination sensors. The DS21T09 also includes an output port that can control the power-down pin of additional terminators (DS21T07) for Wide SCSI applications.

#### DESCRIPTION

The DS21T09 is intended for one chip Plug and Play (PnP) SCSI termination. The DS21T09 is fully compatible with the SCSI-1, Fast SCSI and Ultra SCSI profiles. It provides active termination for 18 signal lines. The DS21T09 is designed to provide high immunity to voltage drops on the SCSI bus. It features a low drop-out regulator, 18 precise, switched 110Ω termination resistors, and bus termination sensors. The DS21T09 also includes an output port that can control the power-down pin of additional terminators (DS21T07) for Wide SCSI applications.

The DS21T09 is intended for one chip Plug and Play (PnP) SCSI termination. The DS21T09 is fully compatible with the SCSI-1, Fast SCSI and Ultra SCSI profiles. It provides active termination for 18 signal lines. The DS21T09 is designed to provide high immunity to voltage drops on the SCSI bus. It features a low drop-out regulator, 18 precise, switched 110Ω termination resistors, and bus termination sensors. The DS21T09 also includes an output port that can control the power-down pin of additional terminators (DS21T07) for Wide SCSI applications.

**DALLAS**  
SEMICONDUCTOR

## DS21T16 SCSI Terminator

### FEATURES

- Fully compliant with SCSI-1, Fast SCSI and Ultra SCSI
- Pin compatible to the DS2107AE and DS21S07AE
- Provides active termination for nine signal lines
- Supports TERMPWR 2.7V – 5.50V
- Low dropout voltage regulator
- Power-down mode isolates termination resistors from the bus
- SCSI bus hot-plug compatible
- Fully supports actively negated SCSI signals
- Onboard thermal shutdown circuitry
- 20-pin plastic TSSOP (Thin Shrink Small Outline Package) (DS21T16E)

### DESCRIPTION

Fast SCSI and Ultra SCSI require the use of active terminations at both ends of every cable segment in a SCSI system with single-ended drivers and receivers. The DS21T16 SCSI Terminator, which is fully compliant with these standards, enables the designer to gain the benefits of active termination: greater immunity to voltage drops on the TERMPWR (TERMinatiOn PoWER) line, enhanced high-level noise immunity, intrinsic TERMPWR decoupling, and very low quiescent current consumption. The DS21T16 integrates a regulator and nine precise switched 110 ohms termination resistors into a monolithic IC. The DS21T16 can be electrically isolated from the SCSI bus without physical removal from the SCSI device.

### FUNCTIONAL DESCRIPTION

The DS21T16 consists of a bandgap reference, buffer amplifier, and nine termination resistors (Figure 1). The bandgap reference circuit produces a precise 2.55V

### PIN ASSIGNMENT

TERMPWR1	1	20	PD
HS-GND	2	19	VREF2
R1	3	18	HS-GND
R2	4	17	NC
R3	5	16	R9
R4	6	15	R8
R5	7	14	R7
HS-GND	8	13	R6
VREF1	9	12	HS-GND
GND	10	11	TERMPWR2

DS21T16E 20-PIN TSSOP (173 MIL)

level which is fed to a buffer amplifier. The buffer produces a 2.7V level and is capable of sourcing at least 24 mA into each of the termination resistors when the signal line is low (active). When the driver for a given signal line turns off, the terminator will pull the signal line to 2.7V (quiescent state). To handle actively negated SCSI signals, the buffer can sink at least 200 mA, and V<sub>REF</sub> will move less than 60 mV. When all lines settle in the quiescent state, the regulator will consume about 2.5 mA. When the DS21T16 is put into power-down mode by bringing PD low, the power-down circuitry will turn off the transistors on each signal line. This will isolate the DS21T16 from the signal lines and effectively remove it from the circuit. The power-down pin (PD) has an internal 50KΩ pull-up resistor. To place the DS21T16 into an active state, the PD pin should be left open circuited. When installed on disk drives or RAID system components, the DS21T16 will not affect the SCSI bus during a hot plug operation.



DS2108

Differential SCSI Switchable Terminator

**FEATURES**

- Fully compliant with SCSI, SCSI-2 and SCSI-3 standards
- Conforms to EIA RS-485 standard
- Provides differential termination for 9 pairs of signal lines
- Operates with SCSI signal voltages of -7 to +12 Volts
- Laser-trimmed 330 and 150 ohm termination resistors have  $\pm 5\%$  tolerance over full temperature range
- Switchable power down mode
- Low power down capacitance of 6 pF
- 24-pin plastic SOIC (DS2108S)

**PIN ASSIGNMENT**

TPWR	<input type="checkbox"/>	1	24	<input type="checkbox"/> PD
R1N	<input type="checkbox"/>	2	23	<input type="checkbox"/> GND
R2N	<input type="checkbox"/>	3	22	<input type="checkbox"/> R1P
R3N	<input type="checkbox"/>	4	21	<input type="checkbox"/> R2P
R4N	<input type="checkbox"/>	5	20	<input type="checkbox"/> R3P
R5N	<input type="checkbox"/>	6	19	<input type="checkbox"/> R4P
R6N	<input type="checkbox"/>	7	18	<input type="checkbox"/> R5P
R7N	<input type="checkbox"/>	8	17	<input type="checkbox"/> R6P
R8N	<input type="checkbox"/>	9	16	<input type="checkbox"/> R7P
R9N	<input type="checkbox"/>	10	15	<input type="checkbox"/> R8P
TPWR	<input type="checkbox"/>	11	14	<input type="checkbox"/> R9P
NC	<input type="checkbox"/>	12	13	<input type="checkbox"/> GND

DS2108S 24-PIN SOIC (300 MIL)

**DESCRIPTION**

The DS2108 SCSI Terminator has been specifically designed for High Voltage Differential (HVD) SCSI systems requiring switchable termination. The DS2108 integrates eighteen 330 ohm and nine 150 ohm precise switched termination resistors into a monolithic IC. The surface mount SOIC package saves board space over conventional resistor SIPs. The termination resistors can be isolated from the SCSI bus under software or hardware control. While in the powered down mode, the DS2108 isolates the 9 terminator blocks from the bus while adding only 6 pF capacitance to each signal line of the SCSI bus.

**FUNCTIONAL DESCRIPTION**

The DS2108 consists of power down circuitry, eighteen 330 ohm and nine 150 ohm termination resistors (Figure 1). The DS2108 can be removed from the circuit by bringing the power down pin ( $\overline{PD}$ ) low. The power down capacitance on the terminating resistors is 6 pF, well below the SCSI-3 allotment of 25 pF. The DS2108 supports SCSI signal voltages of -7 to +12 volts when powered on or off. When all lines settle into the quiescent state (no signal transitions), 56 mA is typically consumed. Only 1 mA is typically consumed in the powered down mode.

**DALLAS**  
SEMICONDUCTOR

**DS2117M**  
Ultra2 LVD/SE SCSI Terminator

### FEATURES

- Fully compliant with Ultra2 SCSI
- Provides Multimode Low Voltage Differential/Single-Ended (LVD/SE) termination for 9 signal line pairs
- Auto-selection of LVD or SE termination
- 5% tolerance on SE and LVD termination resistance
- Low power down capacitance of 3 pF
- Onboard thermal shutdown circuitry
- SCSI bus hot plug compatible
- Fully supports actively negated SE SCSI signals

### PIN ASSIGNMENT

VREF	1	36	TPWR
NC	2	35	HVD
NC	3	34	LVD
R1P	4	33	SE
R1N	5	32	R9N
R2P	6	31	R9P
R2N	7	30	R8N
HS GND	8	29	R8P
HS GND	9	28	HS GND
HS GND	10	27	HS GND
R3P	11	26	HS GND
R3N	12	25	R7N
R4P	13	24	R7P
R4N	14	23	R6N
R5P	15	22	R6P
R5N	16	21	DIFF_CAP
ISO	17	20	DIFFSENSE
GND	18	19	MSTR/SLV

DS2117MB 36-PIN SSOP

**FUNCTIONAL DESCRIPTION**  
The DS2117M Ultra2 LVD/SE SCSI Terminator is both a Low Voltage Differential (LVD) and Single-Ended (SE) terminator. The multimode operation enables the designer to implement LVD in current products while allowing the end-user SE backward compatibility with legacy devices. If the device is connected in an LVD only bus, the DS2117M will use LVD termination. If any SE devices are connected to the bus, the DS2117M will use SE termination. This is accomplished automatically

inside the part by sensing the voltage on the SCSI bus DIFFSENSE line.

For the LVD termination, the DS2117M integrates two current sources with nine precision resistor strings. For the SE termination, one regulator and nine precision 110 Ohm resistors are used. Three DS2117M terminators are needed for a Wide SCSI bus.



DS2118M

Ultra2 LVD/SE SCSI Terminator

**FEATURES**

- Fully compliant with Ultra2 SCSI
- Provides Multimode Low Voltage Differential/Single-Ended (LVD/SE) termination for 9 signal line pairs
- Auto-selection of LVD or SE termination
- 5% tolerance on SE and LVD termination resistance
- Low power down capacitance of 3 pF
- Onboard thermal shutdown circuitry
- SCSI bus hot plug compatible
- Fully supports actively negated SE SCSI signals

**PIN ASSIGNMENT**

VREF	1	36	TPWR
NC	2	35	HVD
NC	3	34	LVD
R1P	4	33	SE
R1N	5	32	R9N
R2P	6	31	R9P
R2N	7	30	R8N
HS GND	8	29	R8P
HS GND	9	28	HS GND
HS GND	10	27	HS GND
R3P	11	26	HS GND
R3N	12	25	R7N
R4P	13	24	R7P
R4N	14	23	R6N
R5P	15	22	R6P
R5N	16	21	DIFF_CAP
ISO	17	20	DIFFSENSE
GND	18	19	MSTR/SLV

DS2118MB 36-PIN SSOP

**DESCRIPTION**

The DS2118M Ultra2 LVD/SE SCSI Terminator is both a Low Voltage Differential (LVD) and Single-Ended (SE) terminator. The multimode operation enables the designer to implement LVD in current products while allowing the end-user SE backward compatibility with legacy devices. If the device is connected in an LVD only bus, the DS2118M will use LVD termination. If any SE devices are connected to the bus, the DS2118M will use SE termination. This is accomplished automatically

inside the part by sensing the voltage on the SCSI bus DIFFSENS line.

For the LVD termination, the DS2118M integrates two regulated supplies with nine precision resistor strings. For the SE termination, one regulator and nine precision 110 ohm resistors are used. Three DS2118M terminators are needed for a Wide SCSI bus.

**DALLAS**  
SEMICONDUCTOR

**DS2119M**  
Ultra2 LVD/SE SCSI Terminator

## FEATURES

- Fully compliant with Ultra2 SCSI
- Provides Multimode Low Voltage Differential/Single-Ended (LVD/SE) termination for 9 signal line pairs
- Auto-selection of LVD or SE termination
- 5% tolerance on SE and LVD termination resistance
- Low power down capacitance of 3 pF
- Onboard thermal shutdown circuitry
- SCSI bus hot plug compatible
- Fully supports actively negated SE SCSI signals

## PIN ASSIGNMENT

VREF	1	28	TPWR
RIP	2	27	TPWR
RIN	3	26	R9N
R2P	4	25	R9P
R2N	5	24	R8N
HS GND	6	23	R8P
R3P	7	22	HS GND
R3N	8	21	R7N
R4P	9	20	R7P
R4N	10	19	R6N
R5P	11	18	R6P
R5N	12	17	DIFF_CAP
ISO	13	16	DIFFSENSE
GND	14	15	MSTR/SLV

DS2119MB 28-PIN TSSOP

## DESCRIPTION

The DS2119M Ultra2 LVD/SE SCSI Terminator is both a Low Voltage Differential (LVD) and Single-Ended (SE) terminator. The multimode operation enables the designer to implement LVD in current products while allowing the end-user SE backward compatibility with legacy devices. If the device is connected in an LVD only bus, the DS2119M will use LVD termination. If any SE devices are connected to the bus, the DS2119M will use SE termination. This is accomplished automatically

inside the part by sensing the voltage on the SCSI bus DIFFSENS line.

For the LVD termination, the DS2119M integrates two current sources with nine precision resistor strings. For the SE termination, one regulator and nine precision 110 Ohm resistors are used. Three DS2119M terminators are needed for a Wide SCSI bus.

## **THERMAL SENSORS**



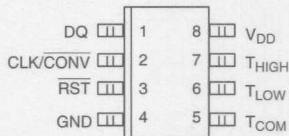
# DS1620

## Digital Thermometer and Thermostat

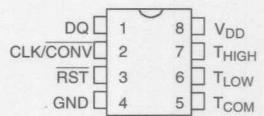
### FEATURES

- Requires no external components
- Supply voltage range covers from 2.7V to 5.5V
- Measures temperatures from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  in  $0.5^{\circ}\text{C}$  increments. Fahrenheit equivalent is  $-67^{\circ}\text{F}$  to  $+257^{\circ}\text{F}$  in  $0.9^{\circ}\text{F}$  increments
- Temperature is read as a 9-bit value
- Converts temperature to digital word in 1 second (max)
- Thermostatic settings are user-definable and non-volatile
- Data is read from/written via a 3-wire serial interface (CLK, DQ,  $\overline{\text{RST}}$ )
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermally sensitive system
- 8-pin DIP or SOIC (208 mil) packages

### PIN ASSIGNMENT



DS1620S 8-PIN SOIC (208 MIL)  
See Mech Drawings Section



DS1620 8-PIN PDIP (300 MIL)  
See Mech Drawings Section

### PIN DESCRIPTION

DQ	— 3-Wire Input/Output
CLK/CONV	— 3-Wire Clock Input and Stand-alone Convert Input
RST	— 3-Wire Reset Input
GND	— Ground
T <sub>HIGH</sub>	— High Temperature Trigger
T <sub>LOW</sub>	— Low Temperature Trigger
T <sub>COM</sub>	— High/Low Combination Trigger
V <sub>DD</sub>	— Power Supply Voltage (3V – 5V)

### DESCRIPTION

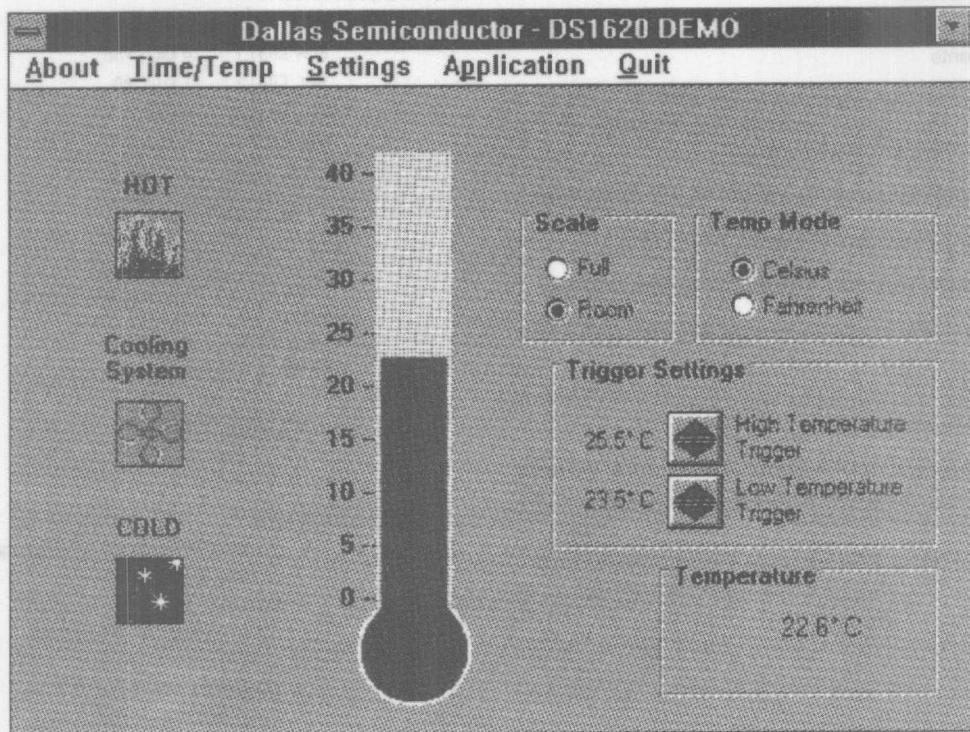
The DS1620 Digital Thermometer and Thermostat provides 9-bit temperature readings which indicate the temperature of the device. With three thermal alarm outputs, the DS1620 can also act as a thermostat.  $T_{\text{HIGH}}$  is driven high if the DS1620's temperature is greater than or equal to a user-defined temperature  $TH$ .  $T_{\text{LOW}}$  is driven high if the DS1620's temperature is less than or equal to a user-defined temperature  $TL$ .  $T_{\text{COM}}$  is driven

high when the temperature exceeds  $TH$  and stays high until the temperature falls below that of  $TL$ .

User-defined temperature settings are stored in non-volatile memory, so parts can be programmed prior to insertion in a system, as well as used in stand-alone applications without a CPU. Temperature settings and temperature readings are all communicated to/from the DS1620 over a simple 3-wire interface.



## DS1620K Digital Thermometer and Thermostat Demonstration Kit



The DS1620K demonstration kit allows a potential user of the DS1620 to observe the operation of the DS1620 in an actual temperature measurement application. Temperature is measured and displayed in a text box, as well as on a graphical thermometer. Thermostat trip-points may be set by the user, and a graphical display of the status of each thermostat output is available on the screen at all times. Temperature may be displayed in Celsius or Fahrenheit.

The DS1620K consists of a small printed circuit board with a DS1620 mounted on it, and a connector and cable is supplied to allow the user to connect the device to a PC parallel port. The demonstration kit "steals" power from the PC's parallel port, so no additional power supplies are needed.

Software is provided that runs under Windows 3.1 and also under DOS.

**DALLAS**  
SEMICONDUCTOR

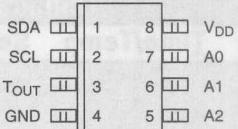
# DS1621

## Digital Thermometer and Thermostat

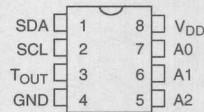
### FEATURES

- Temperature measurements require no external components
- Measures temperatures from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  in  $0.5^{\circ}\text{C}$  increments. Fahrenheit equivalent is  $-67^{\circ}\text{F}$  to  $257^{\circ}\text{F}$  in  $0.9^{\circ}\text{F}$  increments
- Temperature is read as a 9-bit value (2-byte transfer)
- Wide power supply range (2.7V to 5.5V)
- Converts temperature to digital word in 1 second
- Thermostatic settings are user definable and nonvolatile
- Data is read from/written via a 2-wire serial interface (open drain I/O lines)
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermal sensitive system.
- 8-pin DIP or SOIC package (150 mil and 208 mil)

### PIN ASSIGNMENT



DS1621S 8-PIN SOIC (150 MIL)  
DS1621V 8-PIN SOIC (208 MIL)  
See Mech. Drawings  
Section



DS1621  
8-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

### PIN DESCRIPTION

SDA	— 2-Wire Serial Data Input/Output
SCL	— 2-Wire Serial Clock
GND	— Ground
T <sub>OUT</sub>	— Thermostat Output Signal
A0	— Chip Address Input
A1	— Chip Address Input
A2	— Chip Address Input
V <sub>DD</sub>	— Power Supply Voltage

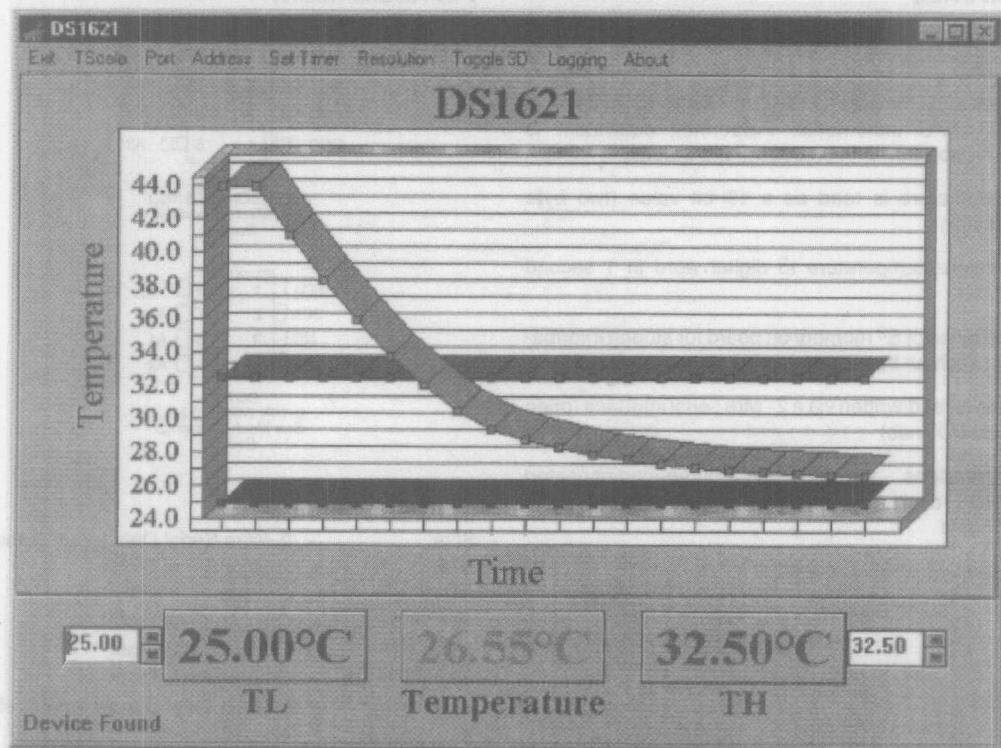
### DESCRIPTION

The DS1621 digital thermometer and thermostat provides 9-bit temperature readings which indicate the temperature of the device. The thermal alarm output, T<sub>OUT</sub>, is active when the temperature of the device exceeds a user-defined temperature TH. The output remains active until the temperature drops below user defined temperature TL, allowing for any hysteresis necessary.

User-defined temperature settings are stored in non-volatile memory, so parts may be programmed prior to insertion in a system. Temperature settings and temperature readings are all communicated to/from the DS1621 over a simple 2-wire serial interface.

**DALLAS**  
SEMICONDUCTOR

## DS1621K Digital Thermometer and Thermostat Demonstration Kit



The DS1621K Demonstration Kit allows a developer to observe the DS1621 in a temperature logging application. While current temperature data is displayed with either 0.5 deg C or 0.01 deg C resolution, the user can change the temperature limits for the thermostat output. All three values are simultaneously shown and updated. Furthermore, the user can set the data acquisition interval in seconds, log temperature automatically to a file, choose between a display in Fahrenheit or Celsius units, and select either 3D or 2D interpretation of the data. The software supports three parallel ports and eight hardware addresses for the DS1621.

The DS1621K consists of a small printed circuit board with a DS1621 pre-configured for address 0x00, a 3.5" floppy with source and executable code, a parallel port adapter, and a 4 ft. RJ-11 cable to connect the PCB to the adapter. Because the PC powers the DS1621, no additional supplies are needed. The software runs under Windows 3.xx and Windows 95.

The example graph reveals the time constant for the 8-pin PDIP package application in still air; with the time interval set to 30 seconds, 63% of change occurs in about 2.5 minutes. The 150-mil SOIC version performs at a significantly faster rate.

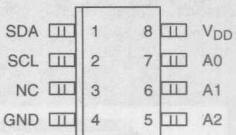
**DALLAS**  
SEMICONDUCTOR

**DS1624**  
Digital Thermometer and Memory

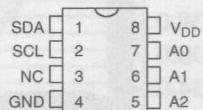
## FEATURES

- Temperature measurements require no external components
- Measures temperatures from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  in  $0.03125^{\circ}\text{C}$  increments. Fahrenheit equivalent is  $-67^{\circ}\text{F}$  to  $+257^{\circ}\text{F}$  in  $0.05625^{\circ}\text{F}$  increments
- Temperature is read as a 13-bit value (two byte transfer)
- Converts temperature to digital word in 1 second (MAX)
- 256 bytes of E<sup>2</sup> memory on board for storing information such as frequency compensation coefficients
- Data is read/written via a 2-wire serial interface (open drain I/O lines)
- Applications include temperature-compensated crystal oscillators for test equipment and radio systems
- 8-pin DIP or SOIC package

## PIN ASSIGNMENT



DS1624S  
8-PIN SOIC (208 MIL)  
See Mech. Drawings  
Section



DS1624  
8-PIN DIP (300 MIL)  
See Mech. Drawings  
Section

## PIN DESCRIPTION

SDA	— 2-Wire Serial Data Input/Output
SCL	— 2-Wire Serial Clock
GND	— Ground
A <sub>0</sub>	— Chip Address Input
A <sub>1</sub>	— Chip Address Input
A <sub>2</sub>	— Chip Address Input
V <sub>DD</sub>	— Digital Power Supply (+3V – +5V)
NC	— No Connection

ds1624 thermometre a 16 bits et 256 bytes de memoire e2. Il est compatible avec les circuits de communication I2C et SPI. Il possede un port de programmation qui permet de lire et d'ecrire les donnees de la memoire et de configurer les parametres du circuit. Il est fabriqu e en SOI et fonctionne entre -55 et +125 degr es Celsius. Il est alimente par une source d'alimentation externe de 3.0 a 5.5 Volts. Il est disponible en deux versions : DS1624S pour la version SOIC et DS1624 pour la version DIP.

## DESCRIPTION

The DS1624 consists of a digital thermometer and 256 bytes of E<sup>2</sup> memory. The thermometer provides 13-bit temperature readings which indicate the temperature of the device. The E<sup>2</sup> memory allows a user to store fre-

quency compensation coefficients for digital correction of crystal frequency due to temperature. Any other type of information may also reside in this user space.

quency compensation coefficients for digital correction of crystal frequency due to temperature. Any other type of information may also reside in this user space.



# DS1629

## 2-Wire Digital Thermometer and Real Time Clock

### FEATURES

- Measures temperatures from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . Fahrenheit equivalent is  $-67^{\circ}\text{F}$  to  $257^{\circ}\text{F}$ .
- Real time clock counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation through the year 2100.
- Thermometer accuracy is  $\pm 2.0^{\circ}\text{C}$  (typ)
- Thermometer resolution is 9 bits (expandable).
- Thermostatic and time alarm settings are user definable. Dedicated open-drain Alarm output.
- 32 bytes SRAM for general data storage.
- Data is read from/written to via a 2-wire serial interface. (open drain I/O lines).
- Wide power supply range ( $2.2\text{V} - 5.5\text{V}$ ).
- Applications include personal computers/PDAs, cellular telephones, office equipment, dataloggers, or any thermally sensitive system.
- 8-pin 150mil SOIC package.

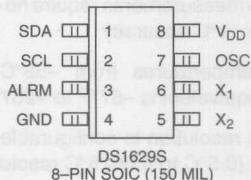
### DESCRIPTION

The DS1629 integrates the critical functions of a real time clock and a temperature monitor in a small outline 8-pin SOIC package. Communication to the DS1629 is accomplished via a 2-wire interface. The wide power supply range and minimal power requirement of the DS1629 allow for accurate time/temperature measurements in battery-powered applications.

The digital thermometer provides 9-bit temperature readings which indicate the temperature of the device. No additional components are required; the device is truly a "temperature-to-digital" converter. The typical accuracy of the sensor is  $\pm 0.5^{\circ}\text{C}$ .

The clock/calendar provides seconds, minutes, hours, day, date of the month, day of the week, month, and year. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap years. It operates in either a 12 or 24-hour format with AM/PM indicator in 12-hour mode.

### PIN ASSIGNMENT



### PIN DESCRIPTION

SDA	— 2-Wire Serial Data Input/Output
SCL	— 2-Wire Serial Clock
GND	— Ground
ALRM	— Thermostat & Clock Alarm Output
X <sub>1</sub>	— 32.768 kHz Crystal Input
X <sub>2</sub>	— 32.768 kHz Crystal Input
OSC	— Buffered Oscillator Output
V <sub>DD</sub>	— Power Supply Voltage (+2.2V to +5V)

The crystal oscillator frequency is internally divided, as specified by device configuration. An open-drain output is provided that can be used as the oscillator input for a microcontroller.

The open-drain alarm output of the DS1629 will become active when either the measured temperature exceeds the programmed over-temperature limit ( $T_H$ ) or current time reaches the programmed alarm setting. The user can configure which event (time only, temperature only, either, or neither) will generate an alarm condition.

For storage of general system data or time/temperature datalogging, the DS1629 features 32 bytes of SRAM.

Applications for the DS1629 include personal computers/PDAs, cellular telephones, office equipment, thermal dataloggers, or any microprocessor-based thermally-sensitive system.

**DALLAS**  
SEMICONDUCTOR

# DS1721

## 2-Wire Digital Thermometer and Thermostat

### FEATURES

- Temperature measurements require no external components with  $\pm 1^\circ\text{C}$  accuracy
- Measures temperatures from  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$ . Fahrenheit equivalent is  $-67^\circ\text{F}$  to  $+257^\circ\text{F}$
- Temperature resolution is configurable from 9 to 12 (default) bits ( $0.5^\circ\text{C}$  to  $0.0625^\circ\text{C}$  resolution)
- Maximum conversion time (9-bit resolution) of 150 ms
- Thermostatic settings are user definable
- Data is read/written via a 2-wire serial interface (open drain I/O lines); 3-bit addressability
- Wide power supply range (2.7V – 5.5V)
- Applications include personal computers, cellular telephones, office equipment, or any thermally sensitive system
- 8-pin 150 mil SOIC package (8-pin µSOP under development)

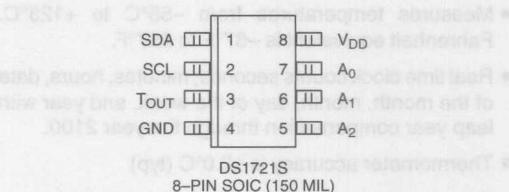
### DESCRIPTION

The DS1721 digital thermometer and thermostat provides 12-bit temperature readings which indicate the temperature of the device. Thermostat settings and temperature readings are all communicated to/from the DS1721 over a simple 2-wire serial interface. No additional components are required; the device is truly a "temperature-to-digital" converter.

The DS1721 has three address bits that allow a user to multidrop up to eight sensors along the 2-wire bus, greatly simplifying the bussing of distributed temperature sensing networks.

The thermal alarm output,  $T_{OUT}$ , is active when the temperature of the device exceeds a user-defined temper-

### PIN ASSIGNMENT



### PIN DESCRIPTION

SDA	– 2-Wire Serial Data Input/Output
SCL	– 2-Wire Serial Clock
GND	– Ground
$T_{OUT}$	– Thermostat Output Signal
$A_0$	– Chip Address Input
$A_1$	– Chip Address Input
$A_2$	– Chip Address Input
$V_{DD}$	– Power Supply Voltage (+5V)

ature  $TH$ . The output remains active until the temperature drops below user-defined temperature  $TL$ , allowing for any hysteresis necessary. The active state of  $T_{OUT}$  is configurable by the user.

For applications that require faster conversion times, the user can adjust the readout resolution from 12 to 9 bits, effectively reducing the conversion time from 1.2 s (MAX) to 150 ms (MAX). This is particularly useful in applications where temperature changes large magnitudes very rapidly.

Applications for DS1721 include personal computers/services, cellular telephones, office equipment, or any microprocessor-based, thermally-sensitive system.

**DALLAS**  
SEMICONDUCTOR

# DS1724

## Programmable Analog/ Digital Thermometer

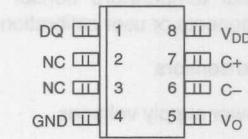
### FEATURES

- Temperature measurements require no external components
- Digital output temperatures measure from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . Fahrenheit equivalent is  $-67^{\circ}\text{F}$  to  $+257^{\circ}\text{F}$
- Temperature is read as a 9-bit digital value ( $0.5^{\circ}\text{C}$  increments)
- Analog voltage output is available for temperatures from  $-25^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ . Fahrenheit equivalent is  $-13^{\circ}\text{F}$  to  $+212^{\circ}\text{F}$
- Temperature is read as a 10-bit analog voltage (5 mV increments) defined by a user-programmable EEPROM look-up-table
- Voltage output measures  $+1.280\text{V}$  to  $+6.395\text{V}$
- Converts temperature to digital word and analog voltage in 1 second (max)
- Digital data is read/written via a 1-Wire™ serial interface
- Applications include temperature-compensated crystal oscillators for test equipment and radio systems
- 8-pin SOIC (xxx-mil) package

### DESCRIPTION

The DS1724 Programmable Analog/Digital Thermometer provides a direct-to-digital temperature reading with no external components required. Furthermore, a user-programmable EEPROM look-up-table (LUT) defines an analog voltage output based on the measured temperature. Digital data is written/read over a simple 1-Wire interface, minimizing required board traces.

### PIN ASSIGNMENT



DS1724S 8-PIN SOIC (xxx MIL)

### PIN DESCRIPTION

DQ	– Digital Data In/Out
V <sub>DD</sub>	– 2.7V – 5.5V Power Supply
GND	– Ground
V <sub>O</sub>	– Analog Voltage Out
C+	– Positive Polarity of Filter Cap
C-	– Negative Polarity of Filter Cap
NC	– No Connect

Applications for the DS1724 include temperature-compensated crystal oscillators (TCXOs) in test and radio equipment. The presence of an analog and digital interface allow the user to compensate for temperature-dependent shifts in frequency in nearly real time.

The small outline surface mount package allows the DS1724 to be in close proximity to the crystal, while consuming a minimal amount of board space.

**DALLAS**  
SEMICONDUCTOR

# DS1780

## CPU Peripheral Monitor

### FEATURES

- Direct-to-digital temperature sensor requires no external components or user calibration
- Two fan speed sensors
- Monitors 6 power supply voltages
- 8-bit DAC for fan speed control
- Intrusion detect for security (detects when chassis lid has been removed, even if power is off)
- Remote system reset
- System interrupt availability on all monitored functions (temperature, voltages, fan speed, chassis intrusion)
- 2-wire interface with 2-bit addressability
- Integrated NAND TREE for board level testability
- Wide power supply range ( $2.8V \leq V_{DD} \leq 5.75V$ )
- High integration in a small 24-pin 173 mil TSSOP
- Applications include monitoring of personal computers or any microprocessor-based system

### DESCRIPTION

The DS1780 is a highly integrated system instrumentation monitor ideal for use in personal computers, or any microprocessor-based system. It monitors ambient temperature, six power supply voltages, and the speed of two fans. Fan speed can also be controlled with the use of an internal 8-bit DAC. All measurements are internally converted to a digital format for easy processing by the CPU.

### PIN ASSIGNMENT

A0/NT <sub>OUT</sub>	1	24	VID0
A1	2	23	VID1
SDA	3	22	VID2
SCL	4	21	VID3
FAN1	5	20	VID4
FAN2	6	19	+V <sub>CCP1</sub>
CHS	7	18	+2.5 V <sub>IN</sub>
GNDD	8	17	+3.3 V <sub>IN</sub>
V <sub>DD</sub>	9	16	+5 V <sub>IN</sub>
INT	10	15	+12 V <sub>IN</sub>
V <sub>OUT</sub> /NT <sub>IN</sub>	11	14	+2.5 V <sub>S</sub> /+V <sub>CCP2</sub>
RST	12	13	GND

DS1780E  
24-PIN TSSOP (173 MIL)

### PIN DESCRIPTION

A0/NT <sub>OUT</sub>	Address input/NAND TREE output
A1	Address input
SDA	2-Wire Serial Data Input/Output
SCL	2-Wire Serial Clock
FANx	Tachometer inputs
CHS	Chassis Intrusion Detector input
GNDD	Digital ground
V <sub>DD</sub>	Power Supply Voltage (2.8V to 5.75V)
INT	Hardware Interrupt output
V <sub>OUT</sub> /NT <sub>IN</sub>	DAC output / NAND TREE input
RST	Remote system reset
GNDA	Analog ground
+xxV <sub>IN</sub>	Positive voltage inputs
+2.5VS/+VCCP2	Positive/negative voltage input
VIDx	Processor voltage supply readout inputs

The DS1780 can be reset to its default power up state via a remote reset function with internal debounce and delay. It features an interrupt that can be programmed to become active should any of the functions the DS1780 is monitoring fall out of spec.

**DALLAS**  
SEMICONDUCTOR

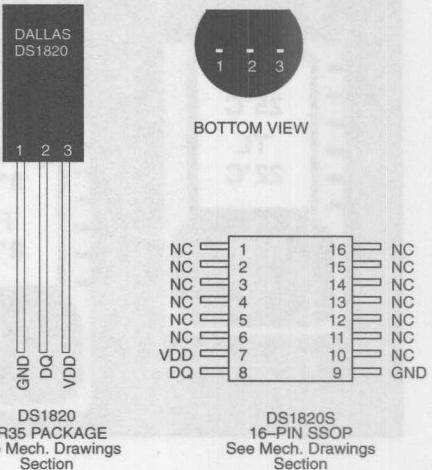
# DS1820

## 1-Wire™ Digital Thermometer

### FEATURES

- Unique 1-Wire™ interface requires only one port pin for communication
- Multidrop capability simplifies distributed temperature sensing applications
- Requires no external components
- Can be powered from data line
- Zero standby power required
- Measures temperatures from -55°C to +125°C in 0.5°C increments. Fahrenheit equivalent is -67°F to +257°F in 0.9°F increments
- Temperature is read as a 9-bit digital value.
- Converts temperature to digital word in 200 ms (typ.)
- User-definable, nonvolatile temperature alarm settings
- Alarm search command identifies and addresses devices whose temperature is outside of programmed limits (temperature alarm condition)
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermally sensitive system

### PIN ASSIGNMENT



### PIN DESCRIPTION

GND	- Ground
DQ	- Data In/Out
V <sub>DD</sub>	- Optional V <sub>DD</sub>
NC	- No Connect

The DS1820 is a 16-pin package. Pin 16 is GND. Pin 15 is NC. Pin 14 is NC. Pin 13 is NC. Pin 12 is NC. Pin 11 is NC. Pin 10 is NC. Pin 9 is GND. Pin 8 is DQ. Pin 7 is V<sub>DD</sub>. Pin 6 is NC. Pin 5 is NC. Pin 4 is NC. Pin 3 is NC. Pin 2 is NC. Pin 1 is NC.

The DS1820S is a 16-pin SSOP package. Pin 16 is GND. Pin 15 is NC. Pin 14 is NC. Pin 13 is NC. Pin 12 is NC. Pin 11 is NC. Pin 10 is NC. Pin 9 is GND. Pin 8 is DQ. Pin 7 is V<sub>DD</sub>. Pin 6 is NC. Pin 5 is NC. Pin 4 is NC. Pin 3 is NC. Pin 2 is NC. Pin 1 is NC.

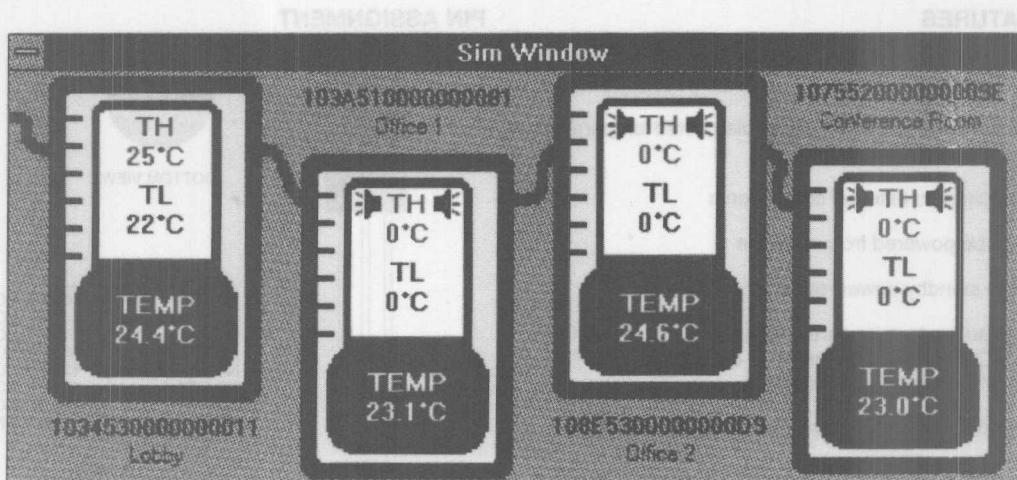
### DESCRIPTION

The DS1820 Digital Thermometer provides 9-bit temperature readings which indicate the temperature of the device.

Information is sent to/from the DS1820 over a 1-Wire interface, so that only one wire (and ground) needs to be

**DALLAS**  
SEMICONDUCTOR

**DS1820K**  
1-Wire™ Digital Thermometer  
Demonstration Kit



The DS1820K demonstration kit allows a potential user of the DS1820 to observe the operation of the DS1820 in an actual, multipoint temperature measurement application.

The DS1820K consists of a connector that attaches to the parallel port of a PC, and two cables with small PC boards attached. These PC boards carry a DS1820 and connector which allows these assemblies to be connected in parallel, so that several DS1820s can be connected to the PC parallel port. The demonstration kit "steals" power from the PCs parallel port, so no additional power supplies are needed.

Each DS1820 contains a unique, 64-bit serial number. The DS1820K software identifies each DS1820 connected to it, and displays the serial number. The user can then assign any name to any device, which can describe what that device corresponds to; for example, "Lobby" or "Office".

In the Simulation window, all devices connected to the PC are shown, along with the current measured temperature. Each DS1820 can also store thermostatic limits; a high limit (TH) and a low limit (TL). These values are displayed for each device. These thermostatic limits can be used to identify to the host which devices are outside their limits, and a corresponding "alarm condition" exists. The Simulation window shows devices in this condition with "alarm icons".

In the "Bus Experimentation" window, the user has full access to all of the registers in the DS1820. Each device which is attached has its ROM code (64-bit serial number) displayed. As more devices are added, the user can learn their ROM codes by performing a "Search ROM". Double-clicking on the ROM code brings up a dialog box which allows the user to enter the name of the device.

**DALLAS  
SEMICONDUCTOR**

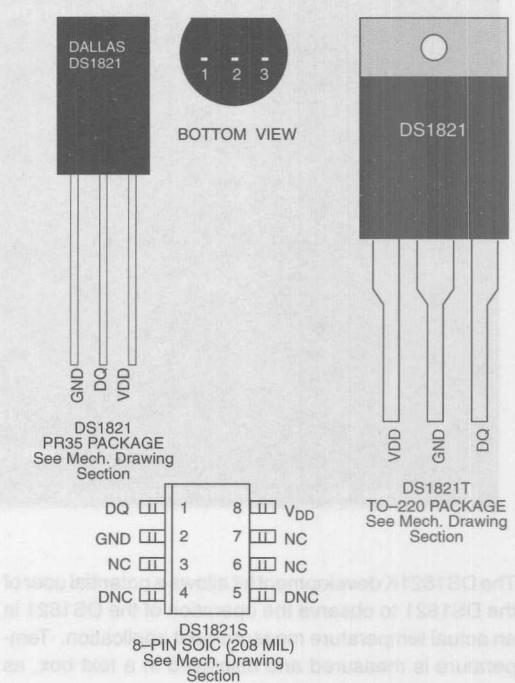
# DS1821

## Programmable Digital Thermostat

### FEATURES

- Requires no external components
- Measures temperatures from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  in  $1^{\circ}\text{C}$  increments. Fahrenheit equivalent is  $-67^{\circ}\text{F}$  to  $+257^{\circ}\text{F}$  in  $1.8^{\circ}\text{F}$  increments
- Converts temperature to digital word in 1 second (max.)
- Thermostatic settings are user definable and nonvolatile
- Available in 3-pin PR35, TO-220, and 8-pin SOIC packages
- Applications include thermostatic controls, industrial systems, consumer products, thermometers, or any thermally sensitive system

### PIN ASSIGNMENT



### PIN DESCRIPTION

GND	— Ground
DQ	— Data In/Out
V <sub>DD</sub>	— Power Supply Voltage +5V
NC	— No Connect
DNC	— Do Not Connect

User-defined temperature settings are stored in non-volatile memory, so parts can be programmed prior to insertion in a system. Communication to/from the DS1821 is accomplished through the DQ pin in a programming mode; this same pin is used in operation as the thermostat output.

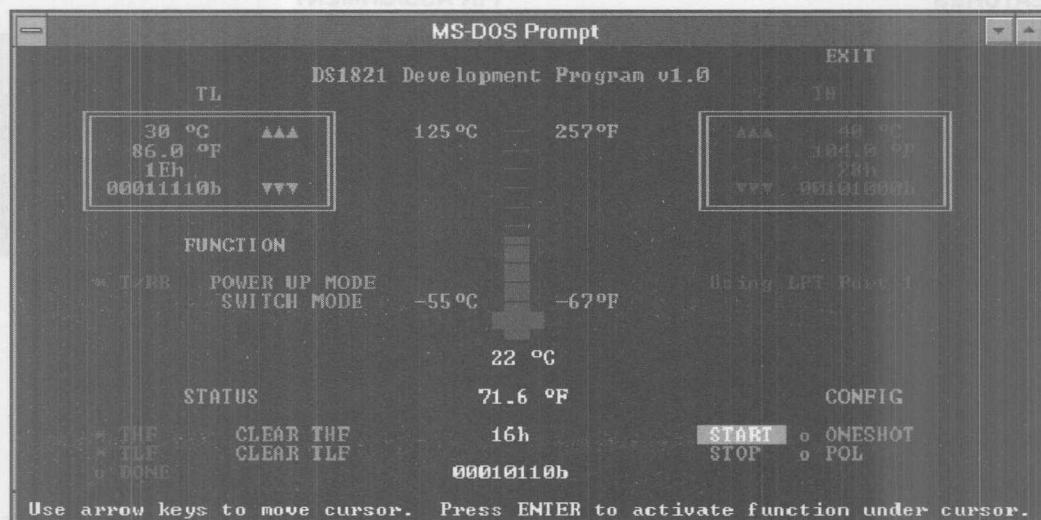
### DESCRIPTION

The DS1821 Programmable Digital Thermostat provides a thermal alarm logic output when the temperature of the device exceeds a user-defined temperature TH. The output remains active until the temperature drops below user defined temperature TL, allowing for any hysteresis necessary.

**DALLAS**  
SEMICONDUCTOR

# DS1821K

## Programmable Digital Thermostat Development Kit



The DS1821K development kit allows a potential user of the DS1821 to observe the operation of the DS1821 in an actual temperature measurement application. Temperature is measured and displayed in a text box, as well as on a graphical thermometer.

Since the DS1821 is intended to be a stand-alone thermostat, a means of setting the thermostat trip points and setting up the part for stand-alone mode is necessary. The DS1821K development kit allows these functions to be performed. Thermostat trip points may be set by the user, and a graphical display of the status of each thermostat output is available on the screen at all times. Temperature may be displayed in Celsius or Fahrenheit.

The DS1821K consists of a small printed circuit board with sockets for a DS1821 and DS1821T mounted on it. (Pads are provided for a socket for the DS1821S, but the socket is not provided. See the README file on the program disk for names of suppliers for suitable sockets.) A connector and cable is supplied to allow the user to connect the device to a PC parallel port. The development kit "steals" power from the PCs parallel port, so no additional power supplies are needed.

Software is provided that runs under DOS.

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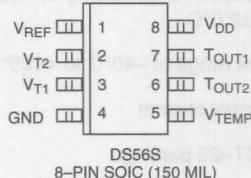
# DS56

## Dual Temperature Comparator

### FEATURES

- Factory calibrated for sensitivity of +6.20 mV/°C and thermometer accuracy of  $\pm 2.0^{\circ}\text{C}$  over the  $0^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  range and  $\pm 3^{\circ}\text{C}$  over the  $40^{\circ}\text{C}$  to  $0^{\circ}\text{C}$  and  $+85^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  range.
- Measurement range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Integrated temperature sensor and voltage reference
- Two independent temperature setpoints with respective logic outputs with set hysteresis
- Narrow-body SO8 (150mil) package
- Wide power supply range ( $2.7\text{V} \leq V_{DD} \leq 5.5\text{V}$ )
- Functionally-compatible with LM56xIM
- Applications include monitoring disk drives, printers, office equipment, HVAC, appliances, or any power/cost/temperature-sensitive environments.

### PIN ASSIGNMENT



### PIN DESCRIPTION

$V_{REF}$	– Bandgap Voltage Reference Output
$V_{T2}$	– Temperature Trip Point 2
$V_{T1}$	– Temperature Trip Point 1
$GND$	– Ground
$V_{TEMP}$	– Temp Sensor Output Voltage
$T_{OUT2}$	– Thermostat Output for Trip Point 2
$T_{OUT1}$	– Thermostat Output for Trip Point 1
$V_{DD}$	– Power Supply Voltage (2.7V to 5.5V)

### DESCRIPTION

The DS56 has two independent open-drain thermostat outputs and respective trip point inputs. The trippoints are set with external resistors that divide down the 1.25V internal bandgap voltage reference. The voltage resulting from this resistive division is compared with the voltage corresponding to the device's junction temperature to define the thermostat output logic state. The internal temperature sensor has a typical sensitivity of +6.2mV/°C and DC offset of +395 mV at  $0^{\circ}\text{C}$ . Both thermostat outputs have 5°C of hysteresis.

For applications that require temperature measurement as well as control, the temperature sensor voltage is brought out to a pin.

The DS56 is packaged in a compact 150 mil 8-pin SOIC. Applications include disk drives, printers, office equipment, HVAC, appliances, or any power/cost/temperature-sensitive environments.

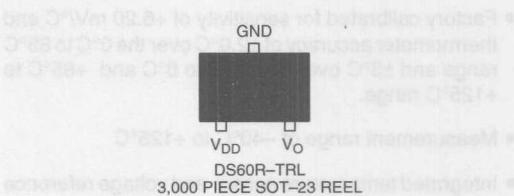


# DS60 Micro-Centigrade Temperature Sensor

## FEATURES

- Factory calibrated for sensitivity of +6.25mV/°C and accuracy of  $\pm 2.0^{\circ}\text{C}$
- Measurement range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Ultra-low supply current
- Compact SOT-23 package
- Wide power supply range ( $2.7\text{V} \leq V_{DD} \leq 5.5\text{V}$ )
- Functionally-compatible with LM60
- Applications include monitoring battery packs, disk drives, printers, office equipment or any space and power sensitive and temperature sensitive environments.

## PIN ASSIGNMENT



## PIN DESCRIPTION

$V_{DD}$	Power Supply Voltage (2.7V to 5.5V)
$V_O$	Sensor Output
GND	Ground

## DESCRIPTION

The DS60 is a factory-calibrated voltage output Centigrade temperature sensor. The thermometer output has a typical sensitivity of +6.25mV/°C and a DC offset of +424 mV. The measurement range is  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ , corresponding to a typical output range of +174 mV to +1205 mV. Because the output voltage is positive for the entire temperature range, there is no need for a negative power supply. The accuracy of the analog output, taking into account amplifier nonlinearity, gain variations, and temperature sensor variations is  $\pm 2.0^{\circ}\text{C}$  from  $0^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  and within  $\pm 3.0^{\circ}\text{C}$  over the full voltage and temperature range.

The power supply range of the DS60 is 2.7V to 5.5V. Its low current requirement of 125  $\mu\text{A}$  and wide supply range make it ideal in battery-powered applications. To further reduce power dissipation, the DS60 can be switched to a zero power standby state by logic gate outputs capable of sourcing current of this magnitude.

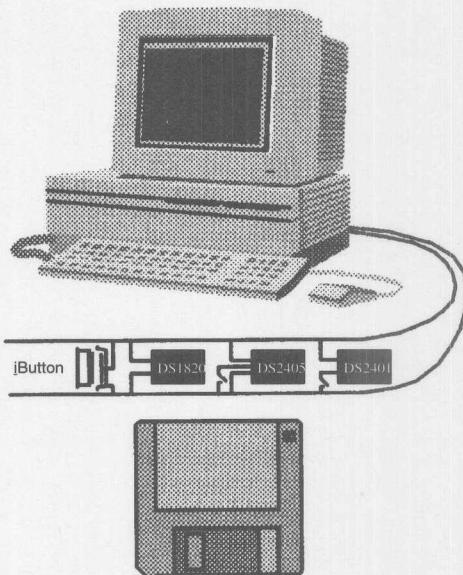
The small size of the SOT-23 package, wide power supply range, and ultra-low power dissipation allow the DS60 to be used in thermal management applications that are currently limited to nonlinear thermistors. These include battery packs, LCD displays, disk drives, power supplies, and appliances.



## DS9091K 1-Wire™ MicroLAN™ Evaluation Kit

### FEATURES

- Evaluation kit for 1-Wire MicroLAN networking through the serial port of an IBM PC-compatible computer
- 5 experiments of different complexity demonstrate typical MicroLAN applications such as window/door monitor, temperature monitor, burglar alarm system with integrated room temperature control
- Easy to understand manual explains experiments, communications protocol, MicroLAN components, theory of operation, interfacing and network optimization
- Featured MicroLAN components: DS2401, DS2405, DS1820, DS1990A, DS1993 and DS9097 Serial-Port adapter
- 3½" disk with evaluation software for Windows including C++ source code listings
- Book of DS19xx iButton Standards
- Automatic Identification Data Book
- Touch Connections Catalog



### DESCRIPTION

The DS9091K MicroLAN Evaluation Kit provides hardware, software and documentation for evaluation of Dallas Semiconductor's 1-Wire MicroLAN technology using integrated circuits and iButtons. The software included in the kit runs under Windows on a PC-compatible DOS computer. It consists of 5 modules demonstrating 1) window/door monitor with DS2401, 2) Window/door monitor with DS2405, 3) Temperature logger with DS1820, 4) simulated room temperature control with DS1820 and DS2405 and 5) burglar alarm system with simulated room temperature control. Each experiment can be expanded by simply adding more components available from Dallas Semiconductor.

The kit includes all special electrical and mechanical components required for the experiments. Not included are unshielded twisted pair cable, mechanical switches and a battery (4.5 or 6V). Experiments 4 and 5 allow controlling an electric heater and air conditioner. The relays for power switching are not included. For demonstration and electrical safety, these appliances are replaced by battery-operated LEDs.

Windows is a trademark of Microsoft Corporation.





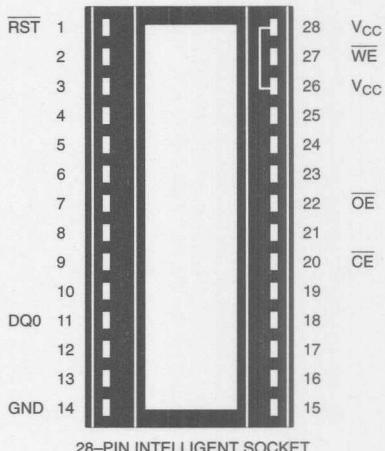
**DALLAS**  
SEMICONDUCTOR

**DS1216B**  
SmartWatch/RAM 16K/64K

## FEATURES

- Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years
- Converts standard 2K x 8 and 8K x 8 CMOS static RAMs into nonvolatile memory
- Embedded lithium energy cell maintains watch information and retains RAM data
- Watch function is transparent to RAM operation
- Month and year determine the number of days in each month; leap year compensation valid up to 2100
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Proven gas-tight socket contacts
- Full  $\pm 10\%$  operating range
- Operating temperature range 0°C to 70°C
- Accuracy is better than  $\pm 1$  min./month @ 25°C

## PIN ASSIGNMENT



## PIN DESCRIPTION

All Pins Pass Through Except 20, 26, 28

Pin 1	$\overline{RST}$	— Reset
Pin 11	DQ0	— Data Input/Output 0
Pin 14	GND	— Ground
Pin 20	$\overline{CE}$	— Conditioned Chip Enable
Pin 22	$\overline{OE}$	— Output Enable
Pin 26	V <sub>CC</sub>	— Switched V <sub>CC</sub> for 24-Pin RAM
Pin 27	$\overline{WE}$	— Write Enable
Pin 28	V <sub>CC</sub>	— Switched V <sub>CC</sub> for 28-Pin RAM

## DESCRIPTION

The DS1216B SmartWatch/RAM 16K/64K is a 28-pin, 600 MIL wide DIP socket with a built-in CMOS watch function, a nonvolatile RAM controller circuit, and an embedded lithium energy source. It accepts either 24-pin 2K x 8 or 28-pin 8K x 8 JEDEC bytewise CMOS static RAM. When the socket is mated with a CMOS SRAM, it provides a complete solution to problems associated with memory volatility and uses a common energy source to maintain time and date. A key feature of the SmartWatch is that the watch function remains transparent to the RAM. The SmartWatch monitors V<sub>CC</sub>

for an out-of-tolerance condition. When such a condition occurs, an internal lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent loss of watch and RAM data.

Using the SmartWatch saves PC board space since the combination of SmartWatch and the mated RAM take up no more area than the memory alone. The SmartWatch uses pins 28, 27, 26, 22, 20, 11, and 1 for RAM and watch control. All other pins are passed straight through to the socket receptacle.

**DALLAS**  
SEMICONDUCTOR

**DS1216C**  
SmartWatch/RAM 64K/256K

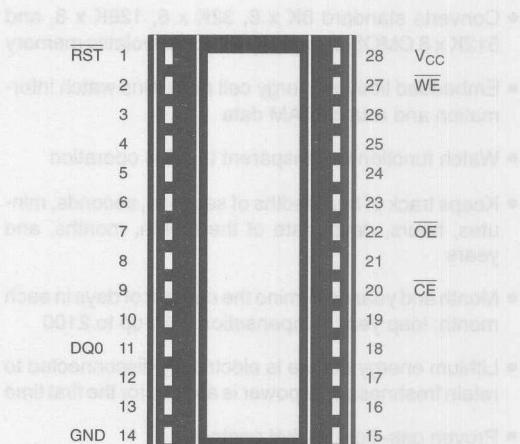
## FEATURES

- Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years
- Converts standard 8K x 8 and 32K x 8 CMOS static RAMs into nonvolatile memory
- Embedded lithium energy cell maintains watch information and retains RAM data
- Watch function is transparent to RAM operation
- Month and year determine the number of days in each month; leap year compensation valid up to 2100
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Proven gas-tight socket contacts
- Full  $\pm 10\%$  operating range
- Operating temperature range 0°C to 70°C
- Accuracy is better than  $\pm 1$  min./month @ 25°C

## DESCRIPTION

The DS1216C SmartWatch/RAM is a 28-pin, 600 MIL wide DIP socket with a built-in CMOS watch function, a nonvolatile RAM controller circuit, and an embedded lithium energy source. It accepts either an 8K x 8 or a 32K x 8 JEDEC bytewide CMOS static RAM. When the socket is mated with a CMOS SRAM, it provides a complete solution to problems associated with memory vol-

## PIN ASSIGNMENT



28-PIN INTELLIGENT SOCKET

## PIN DESCRIPTION

All pins pass through except 20, 28.

Pin 1	RST	- RESET
Pin 11	DQ0	- Data Input/Output 0
Pin 14	GND	- Ground
Pin 20	CE	- Conditioned Chip Enable
Pin 22	OE	- Output Enable
Pin 27	WE	- Write Enable
Pin 28	V <sub>CC</sub>	- Switched V <sub>CC</sub>

ability and uses a common energy source to maintain time and date. A key feature of the SmartWatch is that the watch function remains transparent to the RAM.

See the DS1216B SmartWatch/RAM 16/64K data sheet for technical details.

**DALLAS**  
SEMICONDUCTOR

**DS1216D**  
SmartWatch/RAM 256K/1M

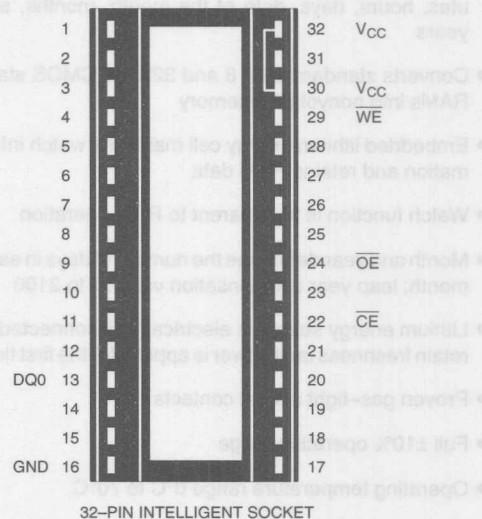
## FEATURES

- Converts standard 8K x 8, 32K x 8, 128K x 8, and 512K x 8 CMOS static RAMs into nonvolatile memory
- Embedded lithium energy cell maintains watch information and retains RAM data
- Watch function is transparent to RAM operation
- Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years
- Month and year determine the number of days in each month; leap year compensation valid up to 2100
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Proven gas-tight socket contacts
- Full  $\pm 10\%$  operating range
- Operating temperature range 0°C to 70°C
- Accuracy is better than  $\pm 1$  min./month @ 25°C

## DESCRIPTION

The DS1216D SmartWatch/RAM 256K/1M is a 32-pin, 600 MIL wide DIP socket with a built-in CMOS watch function, a nonvolatile RAM controller circuit, and an embedded lithium energy source. It accepts either an 8K x 8, 32K x 8, 128K x 8, or 512K x 8 JEDEC bytewide CMOS static RAM. When the socket is mated with a CMOS SRAM, it provides a complete solution to prob-

## PIN ASSIGNMENT



32-PIN INTELLIGENT SOCKET

## PIN DESCRIPTION

All pins pass through except 22, 30 and 32.

Pin 1	RST	- RESET
Pin 13	DQ0	- Data Input/Output 0
Pin 16	GND	- Ground
Pin 22	CE	- Conditioned Chip Enable
Pin 24	OE	- Output Enable
Pin 29	WE	- Write Enable
Pin 30	Vcc	- Switched Vcc for 28-pin RAM
Pin 32	Vcc	- Switched Vcc for 32-pin RAM

lems associated with memory volatility and uses a common energy source to maintain time and date. A key feature of the SmartWatch is that the watch function remains transparent to the RAM.

See the DS1216B SmartWatch/RAM 16/64K data sheet for technical details.

# DALLAS SEMICONDUCTOR

**DS1216E**  
SmartWatch/ROM 64K/256K

## FEATURES

- Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of month, months, and years
  - Adds timekeeping to any 28-pin JEDEC bytewide memory location
  - Embedded lithium energy cell maintains calendar time for more than 10 years in the absence of power
  - Timekeeping function is transparent to memory operation
  - Month and year determine the number of days in each month; leap year compensation valid up to 2100
  - Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
  - Proven gas-tight socket contacts
  - Full  $\pm 10\%$   $V_{CC}$  operating range
  - Operating temperature range  $0^\circ C$  to  $70^\circ C$
  - Accurate to within  $\pm 1$  minute/month @  $25^\circ C$

#### **ORDERING INFORMATION**

**ORDERING INFORMATION**

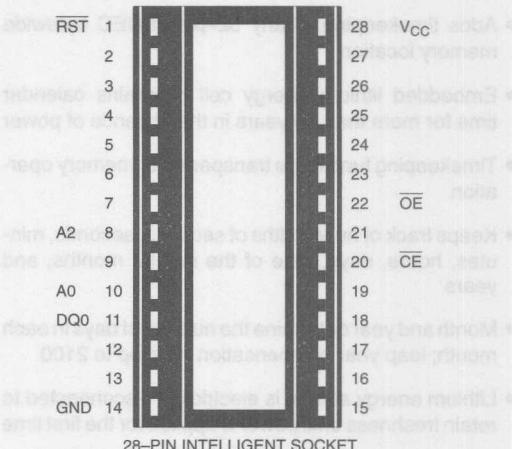
DS1216E	5 volt operation
DS1216E-3	3 volt operation

## **DESCRIPTION**

The DS1216E SmartWatch/ROM 64/256K is a 28-pin, 600 mil-wide DIP socket with a built-in CMOS time-keeper function and an embedded lithium energy source to maintain time and date. It accepts any 28-pin bytewise ROM or volatile RAM. A key feature of the SmartWatch is that the timekeeper function remains transparent to the memory device placed above. The SmartWatch monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, an internal lithium energy source is automatically switched on to prevent loss of watch data.

Using the SmartWatch saves PC board space since the combination of the SmartWatch and the mated memory

## PIN ASSIGNMENT



## PIN DESCRIPTION

Pin 1	$\overline{RST}$	- Reset
Pin 8	A2	- Address Bit 2 (READ/WRITE)
Pin 10	A0	- Address Bit 0 (Data Input)
Pin 11	DQ0	- I/O <sub>0</sub> (Data Output)
Pin 14	GND	- Ground
Pin 20	$\overline{CE}$	- Conditioned Chip Enable
Pin 22	$\overline{OE}$	- Output Enable
Pin 28	V <sub>CC</sub>	- Power Supply Input

All pins pass through to the socket except 20.

device takes up no more area than the memory alone. The SmartWatch uses pins 1, 8, 10, 11, 20, and 22 for timekeeper control. All pins pass through to the socket receptacle except for pin 20 (**CE**), which is inhibited during the transfer of time information.

The SmartWatch provides timekeeping information including hundredths of seconds, seconds, minutes, hours, days, date, month, and year information. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including correction for leap years. The SmartWatch operates in either 24-hour or 12-hour format with an AM/PM indicator.

# DALLAS SEMICONDUCTOR

DS1216F

SmartWatch/ROM 64K/256K/1M

## FEATURES

- Adds timekeeping to any 32-pin JEDEC bytewide memory location
  - Embedded lithium energy cell maintains calendar time for more than 10 years in the absence of power
  - Timekeeping function is transparent to memory operation
  - Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years
  - Month and year determine the number of days in each month; leap year compensation valid up to 2100
  - Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
  - Proven gas-tight socket contacts
  - Full  $\pm 10\%$   $V_{CC}$  operating range
  - Operating temperature range  $0^\circ\text{C}$  to  $70^\circ\text{C}$
  - Accuracy is better than  $\pm 1$  minute/month @  $25^\circ\text{C}$

#### **OBDELIBING INFORMATION**

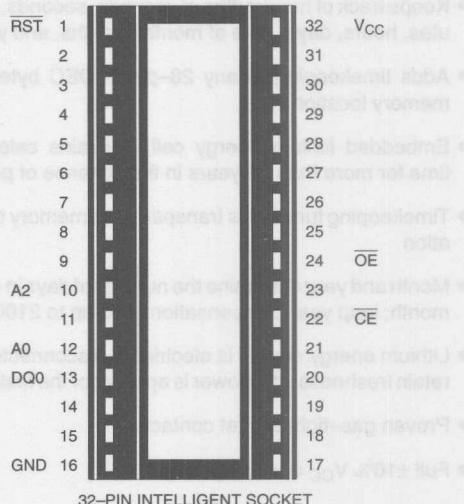
DS1216E 5 volt operation

DS1216F-3 3 volt operation

## **DESCRIPTION**

The DS1216F SmartWatch/ROM is a 32-pin, 600 mil-wide DIP socket with a built-in CMOS timekeeper and an embedded lithium energy source to maintain time and date. It accepts any 32-pin bytewide ROM or volatile RAM. A key feature of the SmartWatch is that the timekeeping function remains transparent to the memory device placed above. The SmartWatch monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, an internal lithium energy source automatically switches on to prevent loss of time and calendar data.

## PIN ASSIGNMENT



## PIN DESCRIPTION

Pin 1	<u>RST</u>	- RESET
Pin 10	A2	- Address Bit 2 (READ/ <u>WRITE</u> )
Pin 12	A0	- Address Bit 0 (Data Input)
Pin 13	DQ0	- I/O <sub>0</sub> (Data Output)
Pin 16	GND	- Ground
Pin 22	<u>CE</u>	- Conditioned Chip Enable
Pin 24	<u>OE</u>	- Output Enable
Pin 32	V <sub>CC</sub>	- Power Supply Input

All pins pass through to the socket except 22.

Using the SmartWatch saves PC board space since the combination of SmartWatch and the mated memory device takes up no more area than the memory alone. The SmartWatch uses pins 1, 10, 12, 13, 22, and 24 for time-keeper control. All pins pass through to the socket receptacle except for pin 22 ( $\overline{CE}$ ), which is inhibited during the transfer of time information.

See the DS1216E SmartWatch/ROM/64/256K data sheet for technical details.

**DALLAS**  
SEMICONDUCTOR

**DS1243Y**  
64K NV SRAM with Phantom Clock

## FEATURES

- Real time clock keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years
- 8K x 8 NV SRAM directly replaces volatile static RAM or EEPROM
- Embedded lithium energy cell maintains calendar operation and retains RAM data
- Watch function is transparent to RAM operation
- Month and year determine the number of days in each month; valid up to 2100
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Standard 28-pin JEDEC pinout
- Full  $\pm 10\%$  operating range
- Operating temperature range 0°C to 70°C
- Accuracy is better than  $\pm 1$  minute/month @ 25°C
- Over 10 years of data retention in the absence of power
- Available in 120, 150 and 200 ns access time

## ORDERING INFORMATION

DS1243Y-XXX

→	-120	120 ns access
	-150	150 ns access

DS1243Y

200 ns access

## DESCRIPTION

The DS1243Y 64K NV SRAM with Phantom Clock is a fully static nonvolatile RAM (organized as 8192 words by 8 bits) with a built-in real time clock. The DS1243Y has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent corrupted data in both the memory and real time clock.

## PIN ASSIGNMENT

RST	1	28	$V_{CC}$
A12	2	27	$\overline{WE}$
A7	3	26	NC
A6	4	25	A8 (EE to MAR)
A5	5	24	A9
A4	6	23	A11 (line to RAM)
A3	7	22	$\overline{OE}$
A2	8	21	A10
A1	9	20	$\overline{CE}$
A0	10	19	DQ7 (line to RAM)
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
720 MIL EXTENDED

## PIN DESCRIPTION

$A_0-A_{12}$	— Address Inputs
$\overline{CE}$	— Chip Enable
GND	— Ground
DQ <sub>0</sub> -DQ <sub>7</sub>	— Data In/Data Out
$V_{CC}$	— Power (+5V)
$\overline{WE}$	— Write Enable
$\overline{OE}$	— Output Enable
NC	— No Connect
RST	— Reset

The Phantom Clock provides timekeeping information including hundredths of seconds, seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with less than 31 days, including correction for leap years. The Phantom Clock operates in either 24-hour or 12-hour format with an AM/PM indicator.

**DALLAS**  
SEMICONDUCTOR

**DS1244Y**  
256K NV SRAM with Phantom Clock

## FEATURES

- Real time clock keeps track of hundredths of seconds, minutes, hours, days, date of the month, months, and years
- 32K x 8 NV SRAM directly replaces volatile static RAM or EEPROM
- Embedded lithium energy cell maintains calendar operation and retains RAM data
- Watch function is transparent to RAM operation
- Month and year determine the number of days in each month; valid up to 1200
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Standard 28-pin JEDEC pinout
- Full 10% operating range
- Operating temperature range 0°C to 70°C
- Accuracy is better than ±1 minute/month @ 25°C
- Over 10 years of data retention in the absence of power
- Available in 120, 150 and 200 ns access time

## ORDERING INFORMATION

DS1244Y-XXX	
→	-120      120 ns access
	-150      150 ns access
	DS1244Y      200 ns access

## DESCRIPTION

The DS1244Y 256K NV SRAM with Phantom Clock is a fully static nonvolatile RAM (organized as 32,768 words by 8 bits) with a built-in real time clock. The DS1244Y has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent garbled data in both the memory and real time clock.

## PIN ASSIGNMENT

A14/RST	1	28	V <sub>CC</sub>
A12	2	27	WE
A7	3	26	A13
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
740 MIL EXTENDED

## PIN DESCRIPTION

A <sub>0</sub> –A <sub>14</sub>	– Address Inputs
CE	– Chip Enable
GND	– Ground
DQ <sub>0</sub> –DQ <sub>7</sub>	– Data In/Data Out
V <sub>CC</sub>	– Power (+5V)
WE	– Write Enable
OE	– Output Enable
NC	– No Connect
RST	– Reset

The Phantom Clock provides timekeeping information including hundredths of seconds, seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with less than 31 days, including correction for leap years. The Phantom Clock operates in either 24-hour or 12-hour format with an AM/PM indicator.

**DALLAS**  
SEMICONDUCTOR

**DS1248Y**  
1024K NV SRAM with Phantom Clock

### FEATURES

- Real time clock keeps track of hundredths of seconds, minutes, hours, days, date of the month, months, and years
- 128K x 8 NV SRAM directly replaces volatile static RAM or EEPROM
- Embedded lithium energy cell maintains calendar operation and retains RAM data
- Watch function is transparent to RAM operation
- Month and year determine the number of days in each month; valid up to 2100
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Standard 28-pin JEDEC pinout
- Full 10% operating range
- Operating temperature range 0°C to 70°C
- Accuracy is better than ±1 minute/month @ 25°C
- Over 10 years of data retention in the absence of power
- Available in 120, 150 and 200 ns access time

### ORDERING INFORMATION

DS1248Y-XXX

→	-120	120 ns access
	-150	150 ns access
	-200	200 ns access

### DESCRIPTION

The DS1248Y 1024K NV SRAM with Phantom Clock is a fully static nonvolatile RAM (organized as 128K words by 8 bits) with a built-in real time clock. The DS1248Y has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent garbled data in both the memory and real time clock.

### PIN ASSIGNMENT

RST	1	32	V <sub>CC</sub>
A16	2	31	A15
A14	3	30	NC
A12	4	29	WE
A7	5	28	A13 TBS to MAP
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	OE
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

32-PIN ENCAPSULATED PACKAGE  
740 MIL FLUSH

### PIN DESCRIPTION

A <sub>0</sub> -A <sub>16</sub>	— Address Inputs
CE	— Chip Enable
GND	— Ground
DQ <sub>0</sub> -DQ <sub>7</sub>	— Data In/Data Out
V <sub>CC</sub>	— Power (+5V)
WE	— Write Enable
OE	— Output Enable
NC	— No Connect
RST	— Reset

The Phantom Clock provides timekeeping information including hundredths of seconds, seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with less than 31 days, including correction for leap years. The Phantom Clock operates in either 24-hour or 12-hour format with an AM/PM indicator.

**DALLAS**  
SEMICONDUCTOR

# DS1251Y

## 4096K NV SRAM with Phantom Clock

### FEATURES

- Real time clock keeps track of hundredths of seconds, minutes, hours, days, date of the month, months, and years
- 512K x 8 NV SRAM directly replaces volatile static RAM or EEPROM
- Embedded lithium energy cell maintains calendar operation and retains RAM data
- Watch function is transparent to RAM operation
- Month and year determine the number of days in each month; valid up to 2100
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Standard 32-pin JEDEC pinout
- Full 10% operating range
- Operating temperature range 0°C to 70°C
- Accuracy is better than ±1 minute/month @ 25°C
- Over 10 years of data retention in the absence of power
- Available in 120 ns and 150 ns access time

### ORDERING INFORMATION

DS1251Y-120	120 ns access
DS1251Y-150	150 ns access

### DESCRIPTION

The DS1251Y 4096K NV SRAM with Phantom Clock is a fully static nonvolatile RAM (organized as 512K words by 8 bits) with a built-in real time clock. The DS1251Y has a self-contained lithium energy source and control circuitry which constantly monitors  $V_{CC}$  for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent garbled data in both the memory and real time clock.

### PIN ASSIGNMENT

A18/RST	1	32	$V_{CC}$
A16	2	31	A15
A14	3	30	A17
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	$\overline{OE}$
A2	10	23	A10
A1	11	22	$\overline{CE}$
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

32-PIN ENCAPSULATED PACKAGE  
740 MIL FLUSH

### PIN DESCRIPTION

$A_0-A_{18}$	– Address Inputs
$\overline{CE}$	– Chip Enable
GND	– Ground
DQ0–DQ <sub>7</sub>	– Data In/Data Out
$V_{CC}$	– Power (+5V)
WE	– Write Enable
$\overline{OE}$	– Output Enable
RST	– Reset

The Phantom Clock provides timekeeping information including hundredths of seconds, seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with less than 31 days, including correction for leap years. The Phantom Clock operates in either 24-hour or 12-hour format with an AM/PM indicator.

**DALLAS**  
SEMICONDUCTOR

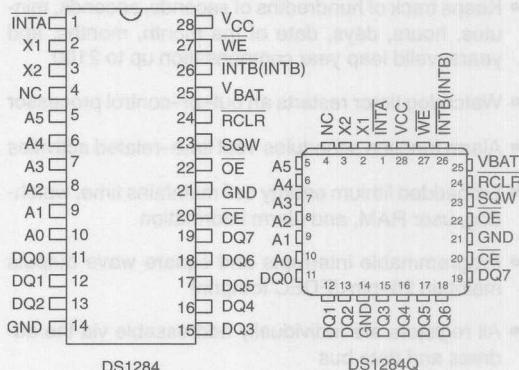
# DS1284

## Watchdog Timekeeper Chip

### FEATURES

- Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years; valid leap year compensation up to 2100
- Watchdog timer restarts an out-of-control processor
- Alarm function schedules real-time related activities
- Programmable interrupts and square wave outputs maintain 28-pin JEDEC footprint
- All registers are individually addressable via the address and data bus
- Accuracy is better than  $\pm 2$  minute/month at 25°C
- 50 bytes of user NV RAM
- Optional 28-pin PLCC surface mount package
- Low-power CMOS circuitry is maintained on less than 0.5  $\mu$ A when power is supplied from battery input
- Optional industrial temperature range available on 28-pin PLCC (-40°C to +85°C)

### PIN ASSIGNMENT



DS1284  
28-PIN DIP (600 MIL)

DS1284Q  
28-PIN PLCC

### PIN DESCRIPTION

INTA	- Interrupt Output A (open drain)
INTB(INTB)	- Interrupt Output B (open drain)
A0-A5	- Address Inputs
DQ0-DQ7	- Data Input/Output
CE	- Chip Enable
OE	- Output Enable
WE	- Write Enable
V <sub>CC</sub>	- +5 Volts
GND	- Ground
NC	- No Connection
SQW	- Square Wave Output
X1,X2	- 32.768 kHz Crystal Connections
V <sub>BAT</sub>	- +3 Volt Battery Input
RCLR	- RAM Clear

### DESCRIPTION

The DS1284 Watchdog Timekeeper Chip is a self-contained real-time clock, alarm, watchdog timer, and interval timer in a 28-pin JEDEC DIP package or a 28-pin PLCC surface mount package. An external crystal and battery are the only components required to maintain

time-of-day and memory status in the absence of power. For a complete description of operating conditions, electrical characteristics, bus timing, and pin descriptions other than X1, X2, V<sub>BAT</sub>, and RCLR, see the DS1286 Watchdog Timekeeper data sheet.

**DALLAS**  
SEMICONDUCTOR

**DS1286**  
Watchdog Timekeeper

## FEATURES

- Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years; valid leap year compensation up to 2100
- Watchdog timer restarts an out-of-control processor
- Alarm function schedules real time-related activities
- Embedded lithium energy cell maintains time, watchdog, user RAM, and alarm information
- Programmable interrupts and square wave outputs maintain 28-pin JEDEC footprint
- All registers are individually addressable via the address and data bus
- Accuracy is better than  $\pm 1$  minute/month at  $25^{\circ}\text{C}$
- Greater than 10 years of timekeeping in the absence of  $V_{CC}$
- 50 bytes of user NV RAM

## PIN ASSIGNMENT

INTA	1	10	11	10	9	28	V <sub>CC</sub>
NC	2				27	WE	
NC	3				26	INTB(INTB)	
NC	4				25	NC	
A5	5				24	NC	
A4	6				23	SQW	
A3	7				22	OE	
A2	8				21	NC	
A1	9				20	CE	
A0	10				19	DQ7	
DQ0	11				18	DQ6	
DQ1	12				17	DQ5	
DQ2	13				16	DQ4	
GND	14				15	DQ3	

28-PIN ENCAPSULATED PACKAGE  
(720 MIL FLUSH)

## PIN DESCRIPTION

INTA	- Interrupt Output A (open drain)
INTB(INTB)	- Interrupt Output B (open drain)
A0-A5	- Address Inputs
DQ0-DQ7	- Data Input/Output
CE	- Chip Enable
OE	- Output Enable
WE	- Write Enable
V <sub>CC</sub>	- +5 Volts
GND	- Ground
NC	- No Connection
SQW	- Square Wave Output

## DESCRIPTION

The DS1286 Watchdog Timekeeper is a self-contained real time clock, alarm, watchdog timer, and interval timer in a 28-pin JEDEC DIP package. The DS1286 contains an embedded lithium energy source and a quartz crystal which eliminates the need for any external circuitry. Data contained within 64 eight-bit registers can be read or written in the same manner as bytewise static

RAM. Data is maintained in the Watchdog Timekeeper by intelligent control circuitry which detects the status of  $V_{CC}$  and write protects memory when  $V_{CC}$  is out of tolerance. The lithium energy source can maintain data and real time for over ten years in the absence of  $V_{CC}$ .

**DALLAS**  
SEMICONDUCTOR

# DS12885, DS12885Q, DS12885T Real Time Clock

## FEATURES

- Drop-in replacement for IBM AT computer clock/calendar
- Pin configuration closely matches MC146818B and DS1285
- Counts seconds, minutes, hours, days, day of the week, date, month, and year with leap year compensation valid up to 2100
- Binary or BCD representation of time, calendar, and alarm
- 12- or 24-hour clock with AM and PM in 12-hour mode
- Daylight Savings Time option
- Selectable between Motorola and Intel bus timing
- Multiplex bus for pin efficiency
- Interfaced with software as 128 RAM locations
  - 14 bytes of clock and control registers
  - 114 bytes of general purpose RAM
- Programmable square wave output signal
- Bus compatible interrupt signals ( $\overline{IRQ}$ )
- Three interrupts are separately software-maskable and testable
  - Time-of-day alarm once/second to once/day
  - Periodic rates from 122  $\mu$ s to 500 ms
  - End of clock update cycle
- Optional 28-pin PLCC surface mount package or 32-pin TQFP
- Optional industrial temperature range available

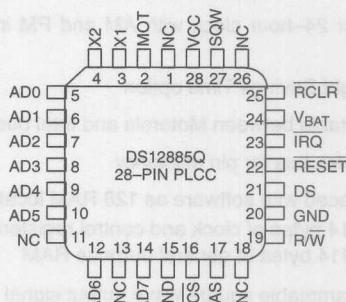
## DESCRIPTION

The DS12885 Real Time Clock plus RAM is designed to be a direct replacement for the DS1285. The DS12885 is identical in form, fit, and function to the DS1285, and has an additional 64-bytes of general purpose RAM. Access to this additional RAM space is determined by the logic level presented on AD6 during the address portion of an access cycle. An external crystal and battery are the only components required to maintain time-of-day and memory status in the absence of power. For a complete description of operating conditions, electrical characteristics, bus timing, and pin descriptions other than X1, X2,  $V_{BAT}$ , and  $\overline{RCLR}$ , see the DS12887 data sheet.

## PIN ASSIGNMENT

MOT	1	24	V <sub>CC</sub>
X1	2	23	SQW
X2	3	22	NC
AD0	4	21	$\overline{RCLR}$
AD1	5	20	$V_{BAT}$
AD2	6	19	$\overline{IRQ}$
AD3	7	18	$\overline{RESET}$
AD4	8	17	DS
AD5	9	16	GND
AD6	10	15	R/W
AD7	11	14	AS
GND	12	13	CS

DS12885 24-PIN DIP  
DS12885S 24-PIN SOIC



NC	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
AD0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	NC
AD1																	NC
AD2																	NC
NC																	NC
AD3																	NC
NC																	NC
AD4																	NC
AD5																	NC
AD6																	NC
NC																	NC
AD7																	NC
GND																	NC
CS																	NC
AS																	NC
R/W																	NC

NC	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
AD0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	NC
AD1																	NC
AD2																	NC
NC																	NC
AD3																	NC
NC																	NC
AD4																	NC
AD5																	NC
AD6																	NC
NC																	NC
AD7																	NC
GND																	NC
CS																	NC
AS																	NC
R/W																	NC

**DALLAS**  
SEMICONDUCTOR

# DS12887

## Real Time Clock

### FEATURES

- Drop-in replacement for IBM AT computer clock/calendar
- Pin compatible with the MC146818B and DS1287
- Totally nonvolatile with over 10 years of operation in the absence of power
- Self-contained subsystem includes lithium, quartz, and support circuitry
- Counts seconds, minutes, hours, days, day of the week, date, month, and year with leap year compensation valid up to 2100
- Binary or BCD representation of time, calendar, and alarm
- 12- or 24-hour clock with AM and PM in 12-hour mode
- Daylight Savings Time option
- Selectable between Motorola and Intel bus timing
- Multiplex bus for pin efficiency
- Interfaced with software as 128 RAM locations
  - 14 bytes of clock and control registers
  - 114 bytes of general purpose RAM
- Programmable square wave output signal
- Bus-compatible interrupt signals (IRQ)
- Three interrupts are separately software-maskable and testable
  - Time-of-day alarm once/second to once/day
  - Periodic rates from 122 µs to 500 ms
  - End of clock update cycle

### DESCRIPTION

The DS12887 Real Time Clock plus RAM is designed to be a direct replacement for the DS1287. The DS12887 is identical in form, fit, and function to the DS1287, and has an additional 64 bytes of general purpose RAM. Access to this additional RAM space is determined by the logic level presented on AD6 during the address portion of an access cycle. A lithium energy source, quartz crystal, and write-protection circuitry are contained within a 24-pin dual in-line package. As such, the

### PIN ASSIGNMENT

MOT	1	24	V <sub>CC</sub>
NC	2	23	SQW
NC	3	22	NC
AD0	4	21	NC
AD1	5	20	NC
AD2	6	19	IRQ
AD3	7	18	RESET
AD4	8	17	DS
AD5	9	16	NC
AD6	10	15	R/W
AD7	11	14	AS
GND	12	13	CS

24 PIN ENCAPSULATED PACKAGE

### PIN DESCRIPTION

AD0–AD7	– Multiplexed Address/Data Bus
NC	– No Connection
MOT	– Bus Type Selection
CS	– Chip Select
AS	– Address Strobe
R/W	– Read/Write Input
DS	– Data Strobe
RESET	– Reset Input
IRQ	– Interrupt Request Output
SQW	– Square Wave Output
V <sub>CC</sub>	– +5 Volt Supply
GND	– Ground

DS12887 is a complete subsystem replacing 16 components in a typical application. The functions include a nonvolatile time-of-day clock, an alarm, a one-hundred-year calendar, programmable interrupt, square wave generator, and 114 bytes of nonvolatile static RAM. The real time clock is distinctive in that time-of-day and memory are maintained even in the absence of power.

**DALLAS**  
SEMICONDUCTOR

**DS12887A**  
Real Time Clock

### FEATURES

- Drop-in replacement for IBM AT computer clock/calendar
- Pin compatible with the MC146818B and DS1287A
- Totally nonvolatile with over 10 years of operation in the absence of power
- Self-contained subsystem includes lithium, quartz, and support circuitry
- Counts seconds, minutes, hours, days, day of the week, date, month, and year with leap year compensation valid up to 2100
- Binary or BCD representation of time, calendar, and alarm
- 12- or 24-hour clock with AM and PM in 12-hour mode
- Daylight Savings Time option
- Selectable between Motorola and Intel bus timing
- Multiplex bus for pin efficiency
- Interfaced with software as 128 RAM locations
  - 14 bytes of clock and control registers
  - 114 bytes of general purpose RAM
- Programmable square wave output signal
- Bus-compatible interrupt signals ( $\overline{IRQ}$ )
- Three interrupts are separately software-maskable and testable
  - Time-of-day alarm once/second to once/day
  - Periodic rates from 122  $\mu$ s to 500 ms
  - End of clock update cycle

### DESCRIPTION

The DS12887A Real Time Clock plus RAM is designed to be a direct replacement for the DS1287A. The DS12887A is identical in form, fit, and function to the DS1287A, and has an additional 64 bytes of general purpose RAM. Access to this additional RAM space is determined by the logic level presented on AD6 during the address portion of an access cycle. The RCLR pin is used to clear (set to logic 1) all 114 bytes of general purpose RAM but does not affect the RAM associated with

### PIN ASSIGNMENT

MOT	1	24	V <sub>CC</sub>
NC	2	23	SQW
NC	3	22	NC
AD0	4	21	RCLR
AD1	5	20	NC
AD2	6	19	$\overline{IRQ}$
AD3	7	18	RESET
AD4	8	17	DS
AD5	9	16	NC
AD6	10	15	R/W
AD7	11	14	AS
GND	12	13	CS

24-PIN ENCAPSULATED PACKAGE

### PIN DESCRIPTION

AD0-AD7	- Multiplexed Address/Data Bus
NC	- No Connection
MOT	- Bus Type Selection
CS	- Chip Select
AS	- Address Strobe
R/W	- Read/Write Input
DS	- Data Strobe
RESET	- Reset Input
IRQ	- Interrupt Request Output
SQW	- Square Wave Output
V <sub>CC</sub>	- +5 Volt Supply
RCLR	- RAM Clear
GND	- Ground

the real time clock. In order to clear the RAM, RCLR must be forced to an input logic "0" (-0.3 to +0.8 volts) during battery back-up mode when V<sub>CC</sub> is not applied. The RCLR function is designed to be used via human interface (shorting to ground manually or by switch) and not to be driven with external buffers. All other operation, description and specification is identical to the DS12887.

**DALLAS**  
SEMICONDUCTOR

## DS1302

### Trickle Charge Timekeeping Chip

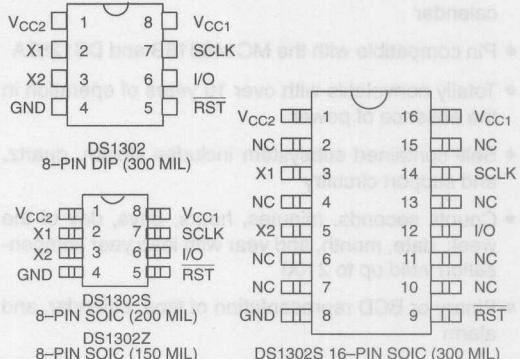
#### FEATURES

- Real time clock counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation valid up to 2100
- 31 x 8 RAM for scratchpad data storage
- Serial I/O for minimum pin count
- 2.0–5.5 volt full operation
- Uses less than 300 nA at 2.0 volts
- Single-byte or multiple-byte (burst mode) data transfer for read or write of clock or RAM data
- Simple 3-wire interface
- TTL-compatible ( $V_{CC} = 5V$ )
- Optional industrial temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- DS1202 compatible
- Added features over DS1202
  - Optional trickle charge capability to  $V_{CC1}$
  - Dual power supply pins for primary and backup power supplies
  - Backup power supply pin can be used for battery or super cap input
  - Additional scratchpad memory (7 bytes)

#### DESCRIPTION

The DS1302 Trickle Charge Timekeeping Chip contains a real time clock/calendar and 31 bytes of static RAM. It communicates with a microprocessor via a simple serial interface. The real time clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with an AM/PM indicator.

#### PIN ASSIGNMENT



#### PIN DESCRIPTION

- |                    |                           |
|--------------------|---------------------------|
| X1, X2             | – 32.768 kHz Crystal Pins |
| GND                | – Ground                  |
| RST                | – Reset                   |
| I/O                | – Data Input/Output       |
| SCLK               | – Serial Clock            |
| $V_{CC1}, V_{CC2}$ | – Power Supply Pins       |

#### ORDERING INFORMATION

PART #	DESCRIPTION
DS1302	Serial Timekeeping Chip; 8-pin DIP
DS1302S	Serial Timekeeping Chip; 8-pin SOIC (200 mil)
DS1302S16	16-pin SOIC (300 mil)
DS1302Z	Serial Timekeeping Chip; 8-pin SOIC (150 mil)

Interfacing the DS1302 with a microprocessor is simplified by using synchronous serial communication. Only three wires are required to communicate with the clock/RAM: (1) RST (Reset), (2) I/O (Data line), and (3) SCLK (Serial clock). Data can be transferred to and from the clock/RAM one byte at a time or in a burst of up to 31 bytes. The DS1302 is designed to operate on very low power and retain data and clock information on less than 1 microwatt.

**DALLAS**  
SEMICONDUCTOR

# DS1305 Serial Alarm Real Time Clock (RTC)

## FEATURES

- Real time clock counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation valid up to 2100
- 96-byte nonvolatile RAM for data storage
- Two Time of Day Alarms – programmable on combination of seconds, minutes, hours, and day of the week
- Serial interface supports Motorola Serial Peripheral Interface (SPI) serial data ports or standard 3-wire interface
- Burst Mode for reading/writing successive addresses in clock/RAM
- Dual power supply pins for primary and backup power supplies
- Optional trickle charge output to backup supply
- 2.0 – 5.5 volt operation
- Optional industrial temperature range –40°C to +85°C
- Available in space-efficient 20-pin TSSOP package

## ORDERING INFORMATION

DS1305	16-Pin DIP
DS1305N	16-Pin DIP (Industrial)
DS1305E	20-Pin TSSOP
DS1305EN	20-Pin TSSOP (Industrial)

## DESCRIPTION

The DS1305 Serial Alarm Real Time Clock provides a full BCD clock calendar which is accessed via a simple serial interface. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. In addition 96 bytes of nonvolatile RAM are provided for data storage.

## PIN ASSIGNMENT

V <sub>CC2</sub>	1	20	V <sub>CC1</sub>
V <sub>BAT</sub>	2	19	NC
X1	3	18	PF
NC	4	17	V <sub>CCIF</sub>
X2	5	16	SDO
NC	6	15	SDI
INT0	7	14	SCLK
NC	8	13	NC
INT1	9	12	CE
GND	10	11	SERMODE

DS1305 20-PIN TSSOP (173 MIL)

V <sub>CC2</sub>	1	16	V <sub>CC1</sub>
V <sub>BAT</sub>	2	15	PF
X1	3	14	V <sub>CCIF</sub>
X2	4	13	SDO
NC	5	12	SDI
INT0	6	11	SCLK
INT1	7	10	CE
GND	8	9	SERMODE

DS1305 16-PIN DIP (300 MIL)

## PIN DESCRIPTION

V <sub>CC1</sub>	– Primary Power Supply
V <sub>CC2</sub>	– Backup Power Supply
V <sub>BAT</sub>	– +3 Volt Battery Input
V <sub>CCIF</sub>	– Interface Logic Power Supply Input
GND	– Ground
X1, X2	– 32,768 Hz Crystal Connection
INT0	– Interrupt 0 Output
INT1	– Interrupt 1 Output
SDI	– Serial Data In
SDO	– Serial Data Out
CE	– Chip Enable
SCLK	– Serial Clock
SERMODE	– Serial Interface Mode
PF	– Power Fail Output

**DALLAS**  
SEMICONDUCTOR

**DS1306**  
Serial Alarm Real Time Clock (RTC)

### FEATURES

- Real time clock counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation valid up to 2100
- 96 byte nonvolatile RAM for data storage
- Two Time of Day Alarms – programmable on combination of seconds, minutes, hours, and day of the week
- 1 Hz and 32.768 kHz clock outputs
- Serial interface supports Motorola Serial Peripheral Interface (SPI) serial data ports or standard 3-wire interface
- Burst Mode for reading/writing successive addresses in clock/RAM
- Dual power supply pins for primary and backup power supplies
- Optional trickle charge output to backup supply
- 2.0–5.5-volt operation
- Optional industrial temperature range –40°C to +85°C
- Available in space-efficient 20-pin TSSOP package

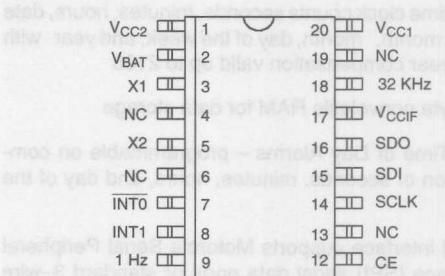
### ORDERING INFORMATION

DS1306	16-Pin DIP
DS1306N	16-Pin DIP (Industrial)
DS1306E	20-Pin TSSOP
DS1306EN	20-Pin TSSOP (Industrial)

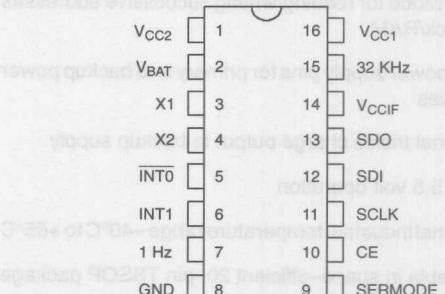
### DESCRIPTION

The DS1306 Serial Alarm Real Time Clock provides a full BCD clock/calendar which is accessed via a simple serial interface. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. In addition 96 bytes of nonvolatile RAM are provided for data storage.

### PIN ASSIGNMENT



DS1306 20-PIN TSSOP (173 MIL)



DS1306 16-PIN DIP (300 MIL)

### PIN DESCRIPTION

Vcc1	– Primary Power Supply
Vcc2	– Backup Power Supply
Vbat	– +3 Volt Battery Input
Vccif	– Interface Logic Power Supply Input
Gnd	– Ground
X1, X2	– 32,768 Hz Crystal Connection
INT0	– Interrupt 0 Output
INT1	– Interrupt 1 Output
SDI	– Serial Data In
SDO	– Serial Data Out
CE	– Chip Enable
SCLK	– Serial Clock
SERMODE	– Serial Interface Mode
1 Hz	– 1 Hz Output
32 KHz	– 32.768 KHz Output

**DALLAS**  
SEMICONDUCTOR

# DS1307

## 64 X 8 Serial Real Time Clock

### FEATURES

- Real time clock counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation valid up to 2100
- 56-byte nonvolatile RAM for data storage
- 2-wire serial interface
- Programmable squarewave output signal
- Automatic power fail detect and switch circuitry
- Consumes less than 500 nA in battery backup mode at 25°C
- Optional industrial temperature range -40°C to +85°C (IND)
- Available in 8-pin DIP or SOIC

### ORDERING INFORMATION

DS1307	Serial Timekeeping Chip; 8-pin DIP
DS1307Z	Serial Timekeeping Chip; 8-pin SOIC (150 mil)
DS1307N	8-pin DIP (IND)
DS1307Z	8-pin SOIC (IND)

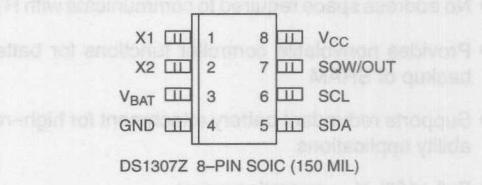
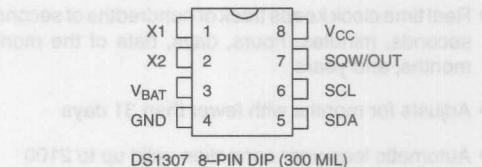
### DESCRIPTION

The DS1307 Serial Real Time Clock is a low power, full BCD clock/calendar plus 56 bytes of nonvolatile SRAM. Address and data are transferred serially via a 2-wire bi-directional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. The DS1307 has a built-in power sense circuit which detects power failures and automatically switches to the battery supply.

### OPERATION

The DS1307 operates as a slave device on the serial bus. Access is obtained by implementing a START condition

### PIN ASSIGNMENT



### PIN DESCRIPTION

V <sub>CC</sub>	— Primary Power Supply
X1, X2	— 32.768 kHz Crystal Connection
V <sub>BAT</sub>	— +3 Volt Battery Input
GND	— Ground
SDA	— Serial Data
SCL	— Serial Clock
SQW/OUT	— Square wave/Output Driver

and providing a device identification code followed by a register address. Subsequent registers can be accessed sequentially until a STOP condition is executed. When V<sub>CC</sub> falls below 1.25 x V<sub>BAT</sub> the device terminates an access in progress and resets the device address counter. Inputs to the device will not be recognized at this time to prevent erroneous data from being written to the device from an out of tolerance system. When V<sub>CC</sub> falls below V<sub>BAT</sub> the device switches into a low current battery backup mode. Upon power up, the device switches from battery to V<sub>CC</sub> when V<sub>CC</sub> is greater than V<sub>BAT</sub>+0.2V and recognizes inputs when V<sub>CC</sub> is greater than 1.25 x V<sub>BAT</sub>. The block diagram in Figure 1 shows the main elements of the Serial Real Time Clock. The following paragraphs describe the function of each pin.

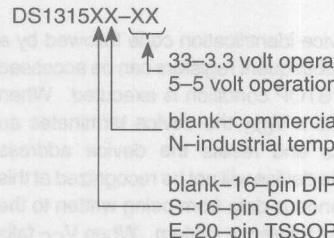
**DALLAS**  
SEMICONDUCTOR

**DS1315**  
Phantom Time Chip

## FEATURES

- Real time clock keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years
- Adjusts for months with fewer than 31 days
- Automatic leap year correction valid up to 2100
- No address space required to communicate with RTC
- Provides nonvolatile controller functions for battery backup of SRAM
- Supports redundant battery attachment for high-reliability applications
- Full  $\pm 10\%$   $V_{CC}$  operating range
- +3.3 volt or +5 volt operation
- Industrial (-45°C to +85°C) operating temperature ranges available
- Drop in replacement for DS1215

## ORDERING INFORMATION



## PIN ASSIGNMENT

	1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
X1																										
X2																										
WE																										
BAT1																										
GND																										
D																										
Q																										
GND																										

16-PIN DIP (300 MIL)

	1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
X1																										
X2																										
WE																										
BAT1																										
GND																										
D																										
Q																										
GND																										

16-PIN SOIC (300 MIL)

	1	20	19	21	18	17	16	15	14	13	12	11	10	11	10	12	13	14	15	16	17	18	19	20	21	22
X1																										
X2																										
WE																										
BAT1																										
NC																										
GND																										
NC																										
BAT1																										
GND																										
D																										
Q																										
GND																										

20-PIN TSSOP

**DALLAS**  
SEMICONDUCTOR

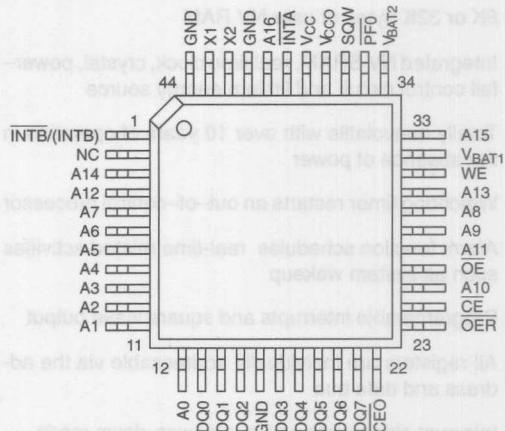
# DS1384

## Watchdog Timekeeping Controller

### FEATURES

- Keeps track of hundredths of seconds, seconds, minutes, hours, days, date of the month, months, and years with leap year compensation valid up to 2100
- Watchdog timer restarts an out-of-control processor
- Alarm function schedules real-time related activities
- Programmable interrupts and square wave outputs
- Bytewide RAM-like access
- 50 bytes of on board user RAM
- Greater than 10 years timekeeping and data retention in the absence of power with small lithium coin cells
- Supports up to 128K x 8 of external static RAM
- All timekeeping registers and on board RAM are individually addressable via the address and data bus

### PIN ASSIGNMENT



### PIN DESCRIPTION

INTA	- Interrupt Output A (open drain)
INTB/(INTB)	- Interrupt Output B (open drain)
A0-A16	- Address Inputs
DQ0-DQ7	- Data Input/Output
CE	- Chip Enable
OE	- Output Enable
WE	- Write Enable
Vcc	- +5 Volt Input
GND	- Ground
NC	- No Connection
SQW	- Square Wave Output
X1, X2	- 32.768 kHz Crystal Connections
PFO	- Power Fail Output
CEO	- Chip Enable RAM
OER	- Output Enable RAM
Vcco	- Voltage Out
Vbat1	- +3 Volt Battery Input
Vbat2	- +3 Volt Battery Input

### DESCRIPTION

The DS1384 Watchdog Timekeeping Controller is a self-contained real time clock, alarm, watchdog timer, and interval timer which provides control of up to 128K x 8 of external low power CMOS static RAM in a 44-pin

quad flat pack package. An external crystal and battery are the only components required to maintain time of day and RAM memory contents in the absence of power.

**DALLAS**  
SEMICONDUCTOR

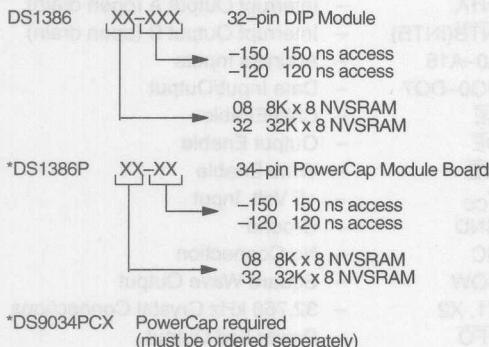
# DS1386/DS1386P

## RAMified Watchdog Timekeeper

### FEATURES

- 8K or 32K bytes of user NV RAM
- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Totally nonvolatile with over 10 years of operation in the absence of power
- Watchdog timer restarts an out-of-control processor
- Alarm function schedules real-time related activities such as system wakeup
- Programmable interrupts and square wave output
- All registers are individually addressable via the address and data bus
- Interrupt signals are active in power-down mode

### ORDERING INFORMATION



### PIN ASSIGNMENT

INTB	1	32	V <sub>CC</sub>	INTA	1	32	V <sub>CC</sub>
	2	31	SQW		2	31	SQW
NC	3	30	V <sub>CC</sub>	A14	3	30	V <sub>CC</sub>
A12	4	29	WE	A12	4	29	WE
A7	5	28	NC	A7	5	28	A13
A6	6	27	A8	A6	6	27	A8
A5	7	26	A9	A5	7	26	A9
A4	8	25	A11	A4	8	25	A11
A3	9	24	OE	A3	9	24	OE
A2	10	23	A10	A2	10	23	A10
A1	11	22	CE	A1	11	22	CE
A0	12	21	DQ7	A0	12	21	DQ7
DQ0	13	20	DQ6	DQ0	13	20	DQ6
DQ1	14	19	DQ5	DQ1	14	19	DQ5
DQ2	15	18	DQ4	DQ2	15	18	DQ4
GND	16	17	DQ3	GND	16	17	DQ3

DS1386 8K x 8  
32-PIN ENCAPSULATED  
PACKAGE

DS1386 32K x 8  
32-PIN ENCAPSULATED  
PACKAGE

INTB (INTB)	1	34	INTA
NC	2	33	SQW
NC	3	32	NC
PFO	4	31	NC
V <sub>CC</sub>	5	30	A12
WE	6	29	A11
OE	7	28	A10
CE	8	27	A9
DQ7	9	26	A8
DQ6	10	25	A7
DQ5	11	24	A6
DQ4	12	23	A5
DQ3	13	22	A4
DQ2	14	21	A3
DQ1	15	X1	GND
DQ0	16	GND	V <sub>BAT</sub>
GND	17	X2	X2

DS1386 8K x 8  
34-PIN POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

INTB (INTB)	1	34	INTA
NC	2	33	SQW
NC	3	32	A14
PFO	4	31	A13
V <sub>CC</sub>	5	30	A12
WE	6	29	A11
OE	7	28	A10
CE	8	27	A9
DQ7	9	26	A8
DQ6	10	25	A7
DQ5	11	24	A6
DQ4	12	23	A5
DQ3	13	22	A4
DQ2	14	21	A3
DQ1	15	X1	GND
DQ0	16	GND	V <sub>BAT</sub>
GND	17	X2	X2

DS1386 32K x 8  
34-PIN POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

**DALLAS**  
SEMICONDUCTOR

# DS14285/DS14287

## Real Time Clock with NV RAM Control

### FEATURES

- Direct replacement for IBM AT computer clock/calendar
- Functionally compatible with the DS1285/DS1287
- Available as chip (DS14285, DS14285S, or DS14285Q) or stand-alone module with embedded lithium battery and crystal (DS14287)
- Automatic backup supply and write protection to make external SRAM nonvolatile
- Counts seconds, minutes, hours, days, day of the week, date, month, and year with leap year compensation valid up to 2100
- Binary or BCD representation of time, calendar, and alarm
- 12- or 24-hour clock with AM and PM in 12-hour mode
- Daylight Savings Time option
- Multiplex bus for pin efficiency
- Interfaced with software as 128 RAM locations
  - 14 bytes of clock and control registers
  - 114 bytes of general purpose RAM
- Programmable square wave output signal
- Bus-compatible interrupt signals (IRQ)
- Three interrupts are separately software-maskable and testable
  - Time-of-day alarm once/second to once/day
  - Periodic rates from 122 µs to 500 ms
  - End of clock update cycle
- Optional industrial temperature version available  
DS14285 DIP, SOIC, and PLCC

### ORDERING INFORMATION

DS14285	RTC Chip; 24-pin DIP
DS14285S	RTC Chip; 24-pin SOIC
DS14285Q	RTC Chip; 28-pin PLCC
DS14287	RTC Module; 24-pin DIP

### PIN ASSIGNMENT

V <sub>CC0</sub>	1	24	V <sub>CC</sub>
X1	2	23	SQW
X2	3	22	CEO
AD0	4	21	CEI
AD1	5	20	V <sub>BAT</sub>
AD2	6	19	IRQ
AD3	7	18	RESET
AD4	8	17	DS
AD5	9	16	GND
AD6	10	15	R/W
AD7	11	14	AS
GND	12	13	CS

DS14285 24-PIN DIP  
DS14285S 24-PIN SOIC

	X2	X1	MOT	V <sub>CC0</sub>	O	V <sub>CC</sub>	SQW	CEO
AD0	4	3	2	1	28	27	26	25
AD1								CEI
AD2							24	V <sub>BAT</sub>
AD3							23	IRQ
AD4							22	RESET
AD5							21	DS
NC	11	12	13	14	15	16	17	20
AD6							19	GND
								R/W
AD7								NC
GND								NC
NC								AS

DS14285Q 28-PIN PLCC

V <sub>CC0</sub>	1	24	V <sub>CC</sub>
NC	2	23	SQW
NC	3	22	CEO
AD0	4	21	CEI
AD1	5	20	NC
AD2	6	19	IRQ
AD3	7	18	RESET
AD4	8	17	DS
AD5	9	16	NC
AD6	10	15	R/W
AD7	11	14	AS
GND	12	13	CS

DS14287 24-PIN ENCAPSULATED PACKAGE

**DALLAS**  
SEMICONDUCTOR

# DS1486/DS1486P

## RAMified Watchdog Timekeeper

### FEATURES

- 128K bytes of user NV RAM
- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Totally nonvolatile with over 10 years of operation in the absence of power
- Watchdog timer restarts an out-of-control processor
- Alarm function schedules real-time related activities such as system wakeup
- Programmable interrupts and square wave output
- All registers are individually addressable via the address and data bus
- Interrupt signals active in power-down mode

### ORDERING INFORMATION

DS1486 XXX (32-pin DIP module)  
 └──→ -150 150 ns access  
     └──→ -120 120 ns access

\*DS1486P XXX 34-pin PowerCap Module Board  
 └──→ -150 150 ns access  
     └──→ -120 120 ns access

\*DS9034PCX PowerCap required  
 (must be ordered separately)

### PIN DESCRIPTION

<u>INTB</u>	- Interrupt Output A (open drain)
<u>INTB (INTB)</u>	- Interrupt Output B (open drain)
<u>A0-A16</u>	- Address Inputs
<u>DQ0-DQ7</u>	- Data Input/Output
<u>CE</u>	- Chip Enable
<u>OE</u>	- Output Enable
<u>WE</u>	- Write Enable
<u>V<sub>CC</sub></u>	- +5 Volts
<u>GND</u>	- Ground
<u>SQW</u>	- Square Wave Output
<u>NC</u>	- No Connection
<u>X<sub>1</sub>, X<sub>2</sub></u>	- Crystal Connection
<u>V<sub>BAT</sub></u>	- Battery Connection

### PIN ASSIGNMENT

INTB (INTB)	1	32	V <sub>CC</sub>
A16	2	31	A15
A14	3	30	INTA/SQW
	4	29	WE
A12	5	28	A13
A7	6	27	A8
A6	7	26	A9
A5	8	25	A11
A4	9	24	OE
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

DS1486 128K x 8  
 32-PIN ENCAPSULATED  
 PACKAGE

INTB (INTB)	1	34	INTA
A15	2	33	SQW
A16	3	32	A14
PFO	4	31	A13
V <sub>CC</sub>	5	30	A12
WE	6	29	A11
OE	7	28	A10
CE	8	27	A9
DQ7	9	26	A8
DQ6	10	25	A7
DQ5	11	24	A6
DQ4	12	23	A5
DQ3	13	22	A4
DQ2	14	21	A3
DQ1	15	20	A2
DQ0	16	19	A1
GND	17	18	A0
		X1	GND
		V <sub>BAT</sub>	X2

34-PIN POWERCAP MODULE BOARD  
 (USES DS9034PCX POWERCAP)

**DALLAS**  
SEMICONDUCTOR

# DS1501/DS1511

## Y2KC Watchdog Real Time Clock

### FEATURES

- BCD coded century, year, month, date, day, hours, minutes, and seconds with automatic leap year compensation valid up to the year 2100
- Programmable Watchdog Timer and RTC Alarm
- Century register; Y2K Compliant RTC
- +3.3 or +5 volt operation
- Precision Power-On Reset
- Power control circuitry supports system power on from date/day/time alarm or key closure/modem detect signal
- 256 bytes user NV SRAM
- Burst Mode for reading/writing successive addresses in NV SRAM
- Auxiliary battery input
- Accuracy of DS1511 is better than  $\pm 1$  min./month @ 25°C
- Day of week/Date alarm register
- Crystal select bit allows RTC to operate with 6 pF or 12.5 pF crystal
- Battery voltage level indicator flags
- Available as chip (DS1501) or standalone module with embedded battery and crystal (DS1511)

### ORDERING INFORMATION

PART #	DESCRIPTION
DS1501Y	5 Volt, 28-pin DIP
DS1501YE	5 Volt, 28-pin TSOP
DS1501YS	5 Volt, 28-pin SOIC
DS1511Y	5 Volt, 28-pin DIP Module
DS1501W	3.3 Volt, 28-pin DIP
DS1501WE	3.3 Volt, 28-pin TSOP
DS1501WS	3.3 Volt, 28-pin SOIC
DS1511W	3.3 Volt, 28-pin DIP Module

### DESCRIPTION

The DS1501/DS1511 is a full function, year 2000 compliant (Y2KC), real-time clock/calendar (RTC) with a RTC alarm, watchdog timer, power-on reset, battery monitors, and 256 bytes non-volatile static RAM in a monolithic chip. User access to all registers within the

### PIN ASSIGNMENT

PWR	1	28	V <sub>CC</sub>
X1	2	27	WE
X2	3	26	V <sub>BAUX</sub>
RST	4	25	V <sub>BAT</sub>
IRQ	5	24	KS
A4	6	23	SQW
A3	7	22	OE
A2	8	21	GND
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN DIP, 28-PIN SOIC

PWR	1	28	V <sub>CC</sub>
X1	2	27	WE
X2	3	26	V <sub>BAUX</sub>
RST	4	25	NC
IRQ	5	24	KS
A4	6	23	SQW
A3	7	22	OE
A2	8	21	NC
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE (720 MIL FLUSH)

PWR	1	28	V <sub>CC</sub>
X1	2	27	WE
X2	3	26	V <sub>BAUX</sub>
RST	4	25	V <sub>BAT</sub>
IRQ	5	24	KS
A4	6	23	SQW
A3	7	22	OE
A2	8	21	NC
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN TSOP

DS1501 is accomplished with a bytewise interface as shown in Figure 1. The RTC registers contain century, year, month, date, day, hours, minutes, and seconds data in 24-hour BCD format. Corrections for day of month and leap year are made automatically.

**DALLAS**  
SEMICONDUCTOR

**DS1543**  
64K NV Timekeeping RAM

## FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the sixteen top RAM locations
- Totally nonvolatile with over 10 years of operation in the absence of power
- Precision Power-On Reset
- Programmable Watchdog Timer and RTC Alarm
- BCD coded year, month, date, day, hours, minutes, and seconds with automatic leap year compensation valid up to the year 2100
- Battery voltage level indicator flag
- Power-fail write protection allows for  $\pm 10\%$  Vcc power supply tolerance
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time

## ORDERING INFORMATION

DS1543P-XXX (5 Volt)

- -70 70 ns access
- -100 100 ns access
- blank 28-pin DIP Module
- P 34-pin PowerCap Module board\*

\*DS1543WP-XXX (3.3 Volt)

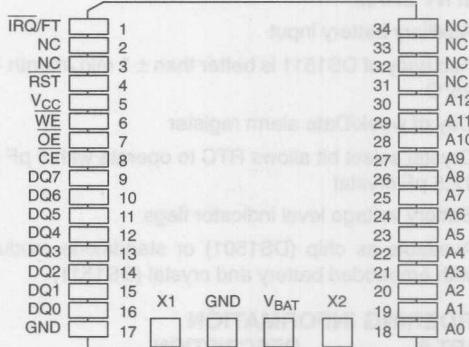
- -120 120 ns access
- -150 150 ns access
- blank 28-pin DIP Module
- P 34-pin PowerCap Module board\*

\*DS9034PCX (PowerCap) Required:  
must be ordered separately

## PIN ASSIGNMENT

RST	1	28	VCC
A12	2	27	WE
A7	3	26	IRQ/FT
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
(700 MIL EXTENDED)



34-PIN POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

## PIN DESCRIPTION

A0-A12	- Address Input
DQ0-DQ7	- Data Input/Outputs
IRQFT	- Interrupt, Frequency Test Output (Open Drain)
RST	- Power-On Reset Output (Open Drain)
CE	- Chip Enable
OE	- Output Enable
WE	- Write Enable
Vcc	- Power Supply Input
GND	- Ground
NC	- No Connection

**DALLAS**  
SEMICONDUCTOR

# DS1553

## 64K NV Y2KC Timekeeping RAM

### FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the sixteen top RAM locations
- Totally nonvolatile with over 10 years of operation in the absence of power
- Precision Power-On Reset
- Programmable Watchdog Timer and RTC Alarm
- BCD coded century, year, month, date, day, hours, minutes, and seconds with automatic leap year compensation valid up to the year 2100
- Battery voltage level indicator flag
- Power-fail write protection allows for  $\pm 10\%$  V<sub>CC</sub> power supply tolerance
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time

### ORDERING INFORMATION

DS1553P-XXX (5 Volt)

→ -70 70 ns access  
-100 100 ns access

→ blank 28-pin DIP Module  
P 34-pin PowerCap Module  
board\*

\*DS1553WP-XXX (3.3 Volt)

→ -120 120 ns access  
-150 150 ns access

→ blank 28-pin DIP Module  
P 34-pin PowerCap Module  
board\*

\*DS9034PCX (PowerCap) Required:  
must be ordered separately

### PIN ASSIGNMENT

RST	1	28	V <sub>CC</sub>
A12	2	27	WE
A7	3	26	IRQ/FT
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
(700 MIL EXTENDED)

IRQ/FT	1	34	NC
NC	2	33	NC
NC	3	32	NC
RST	4	31	NC
V <sub>CC</sub>	5	30	A12
WE	6	29	A11
OE	7	28	A10
CE	8	27	A9
DQ7	9	26	A8
DQ6	10	25	A7
DQ5	11	24	A6
DQ4	12	23	A5
DQ3	13	22	A4
DQ2	14	21	A3
DQ1	15	20	A2
DQ0	16	X1 GND V <sub>BAT</sub> X2	
GND	17	19 A1	
		18 A0	

34-PIN POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

### PIN DESCRIPTION

A0-A12	- Address Input
DQ0-DQ7	- Data Input/Outputs
IRQ/FT	- Interrupt, Frequency Test Output (Open Drain)
RST	- Power-On Reset Output (Open Drain)
CE	- Chip Enable
OE	- Output Enable
WE	- Write Enable
V <sub>CC</sub>	- Power Supply Input
GND	- Ground
NC	- No Connection

**DALLAS**  
SEMICONDUCTOR

# DS1602

## Elapsed Time Counter

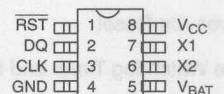
### FEATURES

- Two 32-bit counters keep track of real time and elapsed time
- Counters keep track of seconds for over 125 years
- Battery powered counter counts seconds from the time battery is attached until  $V_{BAT}$  is less than 2.5 volts
- $V_{CC}$  powered counter counts seconds while  $V_{CC}$  is above 4.25 volts and retains the count in the absence of  $V_{CC}$  under battery backup power
- Clear function resets selected counter to zero
- Read/Write serial port affords low pin count
- Maximum current drain of less than 1  $\mu$ A from  $V_{BAT}$  pin when serial port is disabled
- One byte protocol defines read/write, counter address and software clear function
- 8-pin DIP or optional 8-pin SOIC
- Operating temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Reduced performance operation down to  $V_{CC} = 2.5\text{V}$

### PIN ASSIGNMENT



DS1602  
8-PIN DIP (300 MIL)



DS1602  
8-PIN SOIC (200 MIL)

### PIN DESCRIPTION

RST	– Reset
CLK	– Clock
DQ	– Data input/output
GND	– Ground
X1, X2	– Crystal inputs
$V_{BAT}$	– + Battery input
$V_{CC}$	– +5 volts

### DESCRIPTION

The DS1602 is a real time clock/elapsed time counter designed to count seconds when  $V_{CC}$  power is applied and continually count seconds under battery backup power with an additional counter regardless of the condition of  $V_{CC}$ . The continuous counter can be used to derive time of day, week, month, and year by using a software algorithm. The  $V_{CC}$  powered counter will automatically record the amount of time that  $V_{CC}$  power is applied. This function is particularly useful in determining the operational time of equipment in which the

DS1602 is used. Alternatively, this counter can also be used under software control to record real time events. Communication to and from the DS1602 takes place via a 3-wire serial port. A one byte protocol selects read/write functions, counter clear functions and oscillator trim. A low cost 32.768 KHz crystal attaches directly to the X1 and X2 pins. If battery powered only operation is desired, the  $V_{BAT}$  pin must be grounded and the  $V_{CC}$  pin must be connected to the battery.

**DALLAS**  
SEMICONDUCTOR

# DS1603

## Elapsed Time Counter Module

### FEATURES

- Two 32-bit counters keep track of real time and elapsed time
- Counters keep track of seconds for over 125 years
- Battery powered counter counts seconds from the time battery is attached until  $V_{BAT}$  is less than 2.5 volts
- $V_{CC}$  powered counter counts seconds while  $V_{CC}$  is above 4.25 volts and retains the count in the absence of  $V_{CC}$  under battery backup power
- Clear function resets selected counter to zero
- Read/write serial port affords low pin count
- Powered internally by a lithium energy cell that provides over 10 years of operation
- 1-byte protocol defines read/write, counter address and software clear function
- Self-contained crystal provides an accuracy of  $\pm 2$  min per month
- Operating temperature range of 0°C to 70°C
- Low profile SIP module

### PIN ASSIGNMENT

$V_{CC}$	1
RST	2
DQ	3
NC	4
CLK	5
OSC	6
GND	7

### PIN DESCRIPTION

RST	— Reset
CLK	— Clock
DQ	— Data Input/Output
GND	— Ground
$V_{CC}$	— +5 Volts
OSC	— 1 Hz Oscillator Output
NC	— No Connection

### DESCRIPTION

The DS1603 is a real time clock/elapsed time counter designed to count seconds when  $V_{CC}$  power is applied and continually count seconds under battery backup power with an additional counter regardless of the condition of  $V_{CC}$ . The continuous counter can be used to derive time of day, week, month, and year by using a software algorithm. The  $V_{CC}$  powered counter will automatically record the amount of time that  $V_{CC}$  power is applied. This function is particularly useful in determining the operational time of equipment in which the

DS1603 is used. Alternatively, this counter can also be used under software control to record real time events. Communication to and from the DS1603 takes place via a 3-wire serial port. A 1-byte protocol selects read/write functions, counter clear functions and oscillator trim. The device contains a 32.768 kHz crystal which will keep track of time to within  $\pm 2$  min per month. An internal lithium energy source contains enough energy to power the continuous seconds counter for over 10 years.

**DALLAS**  
SEMICONDUCTOR

# DS1615

## Temperature Recorder

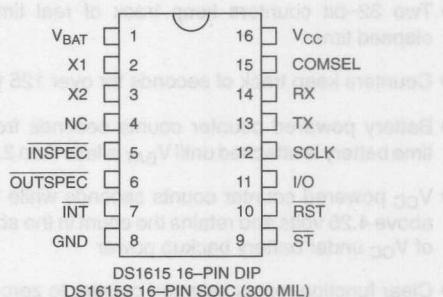
### FEATURES

- Digital thermometer measures temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  in 0.5  $^{\circ}\text{C}$  increments ( $-40^{\circ}\text{F}$  to  $+183.2^{\circ}\text{F}$  in 0.9 $^{\circ}\text{F}$  increments).
- Digital thermometer provides  $\pm 2^{\circ}\text{C}$  accuracy.
- Real Time Clock/Calendar in BCD format counts seconds, minutes, hours, date, month, day of the week, and year with leap year compensation.
- Automatically wakes up and measures temperature at user-programmable intervals from 1 to 255 minutes.
- Logs up to 2048 consecutive temperature measurements in read-only nonvolatile memory.
- Records long-term temperature histogram with 2.0 $^{\circ}\text{C}$  resolution (63 bins).
- Programmable temperature-high and temperature-low alarm trip points.
- Two serial interface options: synchronous and asynchronous
  - 3-wire synchronous serial interface
  - Asynchronous serial interface compatible with standard UARTs.
- Memory partitioned into 32 byte pages for packetizing data.
- On-chip 16-bit CRC generator to safeguard data read operations in asynchronous communications mode.
- Optional unique, factory laseried and tested 64-bit serial number.

### DESCRIPTION

The DS1615 is an integrated temperature recorder that combines a real time clock with temperature data logging and histogram capabilities. It has been designed for applications that require temperature profiling over a

### PIN ASSIGNMENT



### PIN DESCRIPTION

V <sub>BAT</sub>	– Battery Supply
X1	– Crystal Input
X2	– Crystal Output
NC	– No Connect
INSPEC	– In-specification Output
OUTSPEC	– Out-of-specification Output
INT	– Interrupt Output
GND	– Ground
ST	– Start/Status Input
RST	– 3-wire Reset Input
I/O	– 3-wire Input/Output
SCLK	– 3-wire Clock Input
TX	– Transmit Output
RX	– Receive Input
COMSEL	– Communication Select
V <sub>CC</sub>	– +5V Supply

### ORDERING INFORMATION

DS1615	16-Pin DIP
DS1615S	16-Pin SOIC

given period of time. A programmable sampling rate feature makes the device ideal for applications requiring temperature monitoring over short or long time frames.

**DALLAS**  
SEMICONDUCTOR

# DS1642

## Nonvolatile Timekeeping RAM

### FEATURES

- Integrated NV SRAM, real time clock, crystal, power fail control circuit and lithium energy source
- Standard JEDEC bytewide 2K x 8 static RAM pinout
- Clock registers are accessed identical to the static RAM. These registers are resident in the eight top RAM locations.
- Totally nonvolatile with over 10 years of operation in the absence of power
- Access times of 120 ns and 150 ns
- Quartz accuracy  $\pm 1$  minute a month @ 25°C, factory calibrated
- BCD coded year, month, date, day, hours, minutes, and seconds with leap year compensation valid up to 2100
- Power fail write protection allows for  $\pm 10\%$  V<sub>CC</sub> power supply tolerance

### PIN ASSIGNMENT

A7	1	24	V <sub>CC</sub>
A6	2	23	A8
A5	3	22	A9
A4	4	21	WE
A3	5	20	OE
A2	6	19	A10
A1	7	18	CE
A0	8	17	DQ7
DQ0	9	16	DQ6
DQ1	10	15	DQ5
DQ2	11	14	DQ4
GND	12	13	DQ3

### PIN DESCRIPTION

A0–A10	— Address Input
CE	— Chip Enable
OE	— Output Enable
WE	— Write Enable
V <sub>CC</sub>	— +5 Volts
GND	— Ground
DQ0–DQ7	— Data Input/Output

### DESCRIPTION

The DS1642 is a 2K x 8 nonvolatile static RAM with a full function real time clock which are both accessible in a bytewide format. The nonvolatile time keeping RAM is pin- and function-equivalent to any JEDEC standard 2K x 8 SRAM. The device can also be easily substituted in ROM, EPROM and EEPROM sockets, providing read/write nonvolatility and the addition of the real time clock function. The real time clock information resides in the eight uppermost RAM locations. The RTC registers contain year, month, date, day, hours, minutes, and seconds data in 24-hour BCD format. Corrections for the day of the month and leap year are made automatic-

cally. The RTC clock registers are double-buffered to avoid access of incorrect data that can occur during clock update cycles. The double-buffered system also prevents time loss as the timekeeping countdown continues unabated by access to time register data. The DS1642 also contains its own power-fail circuitry which deselects the device when the V<sub>CC</sub> supply is in an out-of-tolerance condition. This feature prevents loss of data from unpredictable system operation brought on by low V<sub>CC</sub> as errant access and update cycles are avoided.



# DS1643/DS1643P

## Nonvolatile Timekeeping RAM

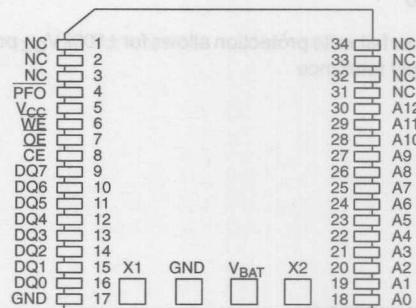
### FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the eight top RAM locations.
- Totally nonvolatile with over 10 years of operation in the absence of power
- Access times of 120 ns and 150 ns
- BCD coded year, month, date, day, hours, minutes, and seconds with leap year compensation valid up to 2100
- Power-fail write protection allows for  $\pm 10\%$  V<sub>CC</sub> power supply tolerance
- DS1643 only (DIP Module)
  - Standard JEDEC Byte-wide 8K x 8 RAM pinout
- DS1643P only (PowerCap Module Board)
  - Surface mountable package for direct connection to PowerCap containing battery and crystal
  - Replaceable battery (PowerCap)
  - Power-fail output
  - Pin-for-pin compatible with other densities of DS164XP Timekeeping RAM

### PIN ASSIGNMENT

NC	1	28	VCC
A12	2	27	WE
A7	3	26	CE2
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
(700 MIL EXTENDED)



34-PIN POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

### ORDERING INFORMATION

- DS1643-XXX 28-pin DIP module
- ▶ -120 120 ns access
  - ▶ -150 150 ns access
- \*DS1643P-XXX 34-pin PowerCap Module Board
- ▶ -120 120 ns access
  - ▶ -150 150 ns access
- \*DS9034PCX (PowerCap) Required;  
must be ordered separately

### PIN DESCRIPTION

- |                  |                                    |
|------------------|------------------------------------|
| A0-A12           | - Address Input                    |
| CE               | - Chip Enable                      |
| CE2              | - Chip Enable 2 (DS1643 only)      |
| OE               | - Output Enable                    |
| WE               | - Write Enable                     |
| V <sub>CC</sub>  | - +5 Volts                         |
| GND              | - Ground                           |
| DQ0-DQ7          | - Data Input/Output                |
| NC               | - No Connect                       |
| PFO              | - Power-Fail Output (DS1643P only) |
| X1, X2           | - Crystal Connection               |
| V <sub>BAT</sub> | - Battery Connection               |

**DALLAS**  
SEMICONDUCTOR

# DS1644/DS1644P

## Nonvolatile Timekeeping RAM

### FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the eight top RAM locations.
- Totally nonvolatile with over 10 years of operation in the absence of power
- Access time of 120 ns and 150 ns
- BCD coded year, month, date, day, hours, minutes, and seconds with leap year compensation valid up to 2100
- Power-fail write protection allows for  $\pm 10\%$  V<sub>CC</sub> power supply tolerance
- DS1644 only (DIP Module)
  - Upward compatible with the DS1643 Timekeeping RAM to achieve higher RAM density
  - Standard JEDEC Byte-wide 32K x 8 static RAM pinout
- DS1644P only (PowerCap Module Board)
  - Surface mountable package for direct connection to PowerCap containing battery and crystal
  - Replaceable battery (PowerCap)
  - Power-fail Output
  - Pin for pin compatible with other densities of DS164XP Timekeeping RAM

### ORDERING INFORMATION

DS1644-XXX 28-pin DIP module

- ↳ -120 120 ns access
- 150 150 ns access

\*DS1644P-XXX 34-pin PowerCap Module Board

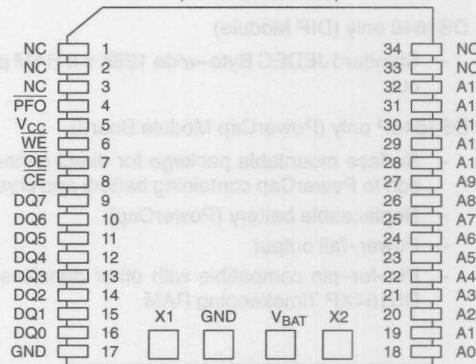
- ↳ -120 120 ns access
- 150 150 ns access

\*DS9034PCX (Power Cap) Required;  
must be ordered separately

### PIN ASSIGNMENT

A14	1	28	VCC
A12	2	27	WE
A7	3	26	A13
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
(720 MIL EXTENDED)



34-PIN POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

### PIN DESCRIPTION

A0-A14	- Address Input
CE	- Chip Enable
OE	- Output Enable
WE	- Write Enable
V <sub>CC</sub>	- +5 Volts
GND	- Ground
DQ0-DQ7	- Data Input/Output
NC	- No Connection
PFO	- Power-fail Output (DS1644P only)
X1, X2	- Crystal Connection
V <sub>BAT</sub>	- Battery Connection

**DALLAS**  
SEMICONDUCTOR

# DS1646/DS1646P

## Nonvolatile Timekeeping RAM

### FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the eight top RAM locations.
- Totally nonvolatile with over 10 years of operation in the absence of power
- Access times of 120 ns and 150 ns
- BCD coded year, month, date, day, hours, minutes, and seconds with leap year compensation valid up to 2100
- Power-fail write protection allows for  $\pm 10\%$   $V_{CC}$  power supply tolerance
- DS1646 only (DIP Module)
  - Standard JEDEC Byte-wide 128K x 8 RAM pin-out
- DS1646P only (PowerCap Module Board)
  - Surface mountable package for direct connection to PowerCap containing battery and crystal
  - Replaceable battery (PowerCap)
  - Power-fail output
  - Pin-for-pin compatible with other densities of DS164XP Timekeeping RAM

### ORDERING INFORMATION

DS1646-XXX 32-pin DIP module

- ↳ -120 120 ns access  
   -150 150 ns access

\*DS1646P-XXX 34-pin PowerCap Module Board

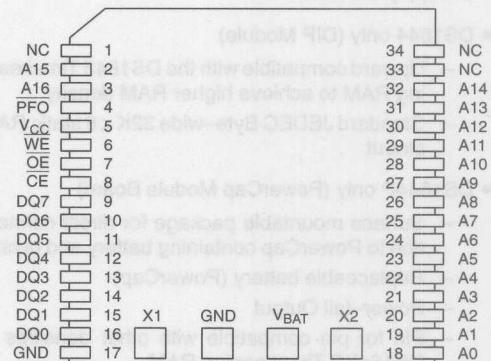
- ↳ -120 120 ns access  
   -150 150 ns access

\*DS9034PCX (PowerCap) Required;  
   must be ordered separately

### PIN ASSIGNMENT

NC	1	32	$V_{CC}$
A16	2	31	A15
A14	3	30	NC
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	$\bar{OE}$
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

32-PIN ENCAPSULATED PACKAGE



34-PIN POWERCAP MODULE BOARD  
 (USES DS9034PCX POWERCAP)

### PIN DESCRIPTION

A0-A16	- Address Input
$\bar{CE}$	- Chip Enable
$\bar{OE}$	- Output Enable
WE	- Write Enable
$V_{CC}$	- +5 Volts
GND	- Ground
DQ0-DQ7	- Data Input/Output
NC	- No Connect
PFO	- Power-Fail Output (DS1646P only)
X1, X2	- Crystal Connection
$V_{BAT}$	- Battery Connection

**DALLAS**  
SEMICONDUCTOR

# DS1647/DS1647P

## Nonvolatile Timekeeping RAM

### FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the eight top RAM locations.
- Totally nonvolatile with over 10 years of operation in the absence of power
- Access times of 120 ns and 150 ns
- BCD coded year, month, data, day, hours, minutes, and seconds with leap year compensation valid up to 2100
- Power-fail write protection allows for  $\pm 10\%$  V<sub>CC</sub> power supply tolerance
- DS1647 only (DIP Module)
  - Upward compatible with the DS1646 Timekeeping RAM
  - Standard JEDEC Byte-wide 512K x 8 static RAM pinout
- DS1647P only (PowerCap Module Board)
  - Surface mountable package for direct connection to PowerCap containing battery and crystal
  - Replaceable battery (PowerCap)
  - Power-fail Output
  - Pin for pin compatible with other densities of DS164XP Timekeeping RAM

### ORDERING INFORMATION

DS1647-XXX (28-pin DIP module)

- -120 120 ns access
- -150 150 ns access

\*DS1647P-XXX (34-pin PowerCap Module Board)

- -120 120 ns access
- -150 150 ns access

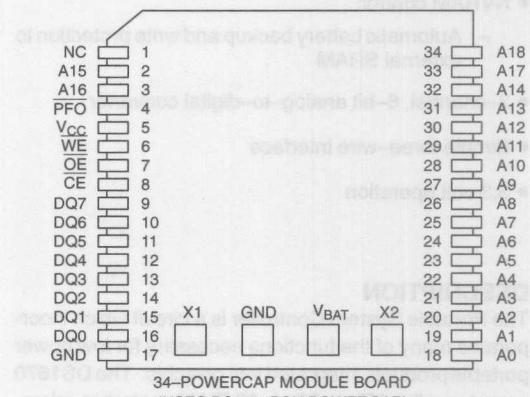
\*DS9034PCX (PowerCap) Required; must be ordered separately

### PIN ASSIGNMENT

A18	1	32	V <sub>CC</sub>
A16	2	31	A15
A14	3	30	A17
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	OE
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

512K X 8

32-PIN ENCAPSULATED PACKAGE



34-POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

### PIN DESCRIPTION

A0-A18	- Address Input
CE	- Chip Enable
OE	- Output Enable
WE	- Write Enable
V <sub>CC</sub>	- +5 Volts
GND	- Ground
DQ0-DQ7	- Data Input/Output
NC	- No Connection
PFO	- Power-Fail Output (DS1647P only)
X1, X2	- Crystal Connection
V <sub>BAT</sub>	- Battery Connection



# DS1670

## Portable System Controller

### FEATURES

- Provides real time clock:
  - Counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation valid up to 2100
  - Power control circuitry supports system power on from day/time alarm
- Microprocessor monitor:
  - Halts microprocessor during power fail
  - Automatically restarts microprocessor after power failure
  - Monitors pushbutton for external override
  - Halts and resets an out of control microprocessor
- NVRAM control:
  - Automatic battery backup and write protection to external SRAM
- 3-channel, 8-bit analog-to-digital converter
- Simple three-wire interface
- 3.3 volt operation

### DESCRIPTION

The Portable System Controller is a circuit which incorporates many of the functions necessary for low power portable products integrated into one chip. The DS1670 provides a Real Time Clock, NVRAM controller, microprocessor monitor, and a 3-channel 8-bit analog-to-digital converter. Communication with the DS1670 is established through a simple 3-wire interface.

The Real Time Clock (RTC) provides seconds, minutes, hours, day, date, month, and year information with leap year compensation. The RTC also provides an alarm interrupt. This interrupt works when the DS1670 is pow-

### PIN ASSIGNMENT

V <sub>BAT</sub>	1	20	S <sub>T</sub>
V <sub>CCO</sub>	2	19	V <sub>CC</sub>
SCLK	3	18	X <sub>1</sub>
I/O	4	17	X <sub>2</sub>
CS	5	16	A <sub>IN0</sub>
CEI	6	15	A <sub>IN1</sub>
CEOL	7	14	A <sub>IN2</sub>
CEOH	8	13	RST
INT	9	12	BLE
GND	10	11	BHE

20-PIN TSSOP  
20-PIN SOIC

ered by the system power supply or when in battery backup operation so the alarm can be used to wake up a system that is powered down.

Automatic backup and write protection of external SRAM is provided through the V<sub>CCO</sub>, CEOL, and CEOH pins. The backup energy source used to power the RTC is also used to retain RAM data in the absence of V<sub>CC</sub> through the V<sub>CCO</sub> pin. The chip enable outputs to RAM (CEOL and CEOH) are controlled during power transients to prevent data corruption.

**DALLAS**  
SEMICONDUCTOR

# DS1673

## Portable System Controller

### FEATURES

- Provides Real Time Clock:
  - Counts seconds, minutes, hours, date of the month, month, day of the week, and year with leap year compensation valid up to 2100
  - Power control circuitry supports system power on from day/time alarm
- Microprocessor monitor:
  - Halts microprocessor during power-fail
  - Automatically restarts microprocessor after power failure
  - Monitors push-button for external override
  - Halts and resets an out of control microprocessor
- NV RAM control:
  - Automatic battery backup and write protection to external SRAM
- 3-channel, 8-bit analog-to-digital converter
- Simple 3-wire interface
- +3.0- or +5.0-volt operation

### ORDERING INFORMATION

DS1673E-X	20-pin TSSOP
DS1673S-X	20-pin SOIC
	→ 3 +3-volt operation 5 +5-volt operation

### DESCRIPTION

The Portable System Controller is a circuit which incorporates many of the functions necessary for low power portable products integrated into one chip. The DS1673 provides a Real Time Clock, NV RAM controller, microprocessor monitor, and a 3-channel, 8-bit analog-to-digital converter. Communication with the DS1673 is established through a simple 3-wire interface.

The Real Time Clock (RTC) provides seconds, minutes, hours, day, date, month, and year information with leap year compensation. The RTC also provides an alarm interrupt. This interrupt works when the DS1673 is pow-

### PIN ASSIGNMENT

V <sub>BAT</sub>	1	20	ST
V <sub>CCO</sub>	2	19	V <sub>CC</sub>
SCLK	3	18	X <sub>1</sub>
I/O	4	17	X <sub>2</sub>
CS	5	16	A <sub>IN0</sub>
CEI	6	15	A <sub>IN1</sub>
CEO <sub>L</sub>	7	14	A <sub>IN2</sub>
CEO <sub>H</sub>	8	13	RST
INT	9	12	BLE
GND	10	11	BHE

20-PIN TSSOP  
20-PIN SOIC

ered by the system power supply or when in battery backup operation so the alarm can be used to wake up a system that is powered down.

Automatic backup and write protection of external SRAM is provided through the V<sub>CCO</sub>, CEO<sub>L</sub>, and CEO<sub>H</sub> pins. The backup energy source used to power the RTC is also used to retain RAM data in the absence of V<sub>CC</sub> through the V<sub>CCO</sub> pin. The chip-enable outputs to RAM (CEO<sub>L</sub> and CEO<sub>H</sub>) are controlled during power transients to prevent data corruption.

**DALLAS**  
SEMICONDUCTOR

## DS1685/DS1687 3-Volt/5-Volt Real Time Clock

### FEATURES

Incorporates industry standard DS1287 PC clock plus enhanced features:

- Y2K-compliant
- +3- or +5-volt operation
- 64-bit silicon serial number
- Power control circuitry supports system power on from date/time alarm or key closure
- 32 kHz output for power management
- Crystal select bit allows RTC to operate with 6 pF or 12.5 pF crystal
- SMI Recovery Stack
- 242 bytes user NV RAM
- Auxiliary battery input
- RAM clear input
- Century register
- Date alarm register
- Compatible with existing BIOS for original DS1287 functions
- Available as chip (DS1685) or standalone module with embedded battery and crystal (DS1687)
- Timekeeping algorithm includes leap year compensation valid up to 2100

### ORDERING INFORMATION

PART #	DESCRIPTION
DS1685-X	RTC Chip; 24-pin DIP
DS1685E-X	RTC Chip; 24-pin TSSOP
DS1685S-X	RTC Chip; 24-pin SOIC
DS1685Q-X	RTC Chip; 28-pin PLCC
DS1687-X	RTC Module; 24-pin DIP



- 3 +3-volt device
- 5 +5-volt device

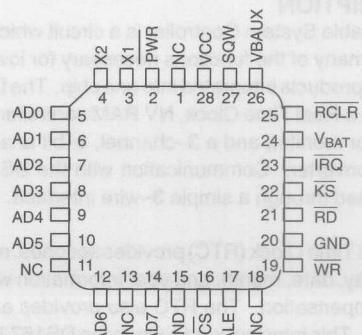
### PIN ASSIGNMENT

PWR	1	24	V <sub>CC</sub>
X1	2	23	SQW
X2	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	V <sub>BAT</sub>
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	GND
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS1685 24-PIN DIP  
DS1685S 24-PIN SOIC  
DS1685E 24-PIN TSSOP

PWR	1	24	V <sub>CC</sub>
NC	2	23	SQW
NC	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	NC
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	NC
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS1687 24-PIN ENCAPSULATED PACKAGE



DS1685Q 28-PIN PLCC

**DALLAS**  
SEMICONDUCTOR

## DS1688/DS1691

3-Volt/5-Volt Serialized Real Time Clock  
with NV RAM Control

### FEATURES

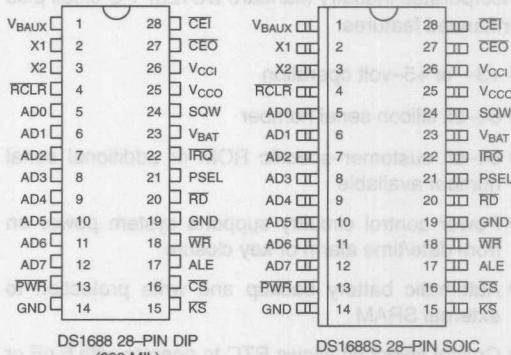
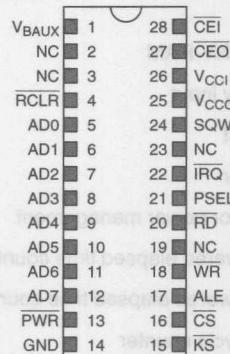
Incorporates industry standard DS1287 PC clock plus enhanced features:

- +3- or +5-volt operation
- 64-bit silicon serial number
- 64-bit customer-specific ROM or additional serial number available
- Power control circuitry supports system power on from date/time alarm or key closure
- Automatic battery backup and write protection to external SRAM
- Crystal select bit allows RTC to operate with 6 pF or 12.5 pF crystal
- 114 bytes user NV RAM
- Auxiliary battery input
- RAM clear input
- Century register
- 32 kHz output for power management
- 32-bit V<sub>CC</sub> powered elapsed time counter
- 32-bit V<sub>BAT</sub> powered elapsed time counter
- 16-bit power cycle counter
- Compatible with existing BIOS for original DS1287 functions
- Available as chip (DS1688) or stand-alone module with embedded battery and crystal (DS1691)
- Timekeeping algorithm includes leap year compensation valid up to 2100

### ORDERING INFORMATION

PART #	DESCRIPTION
DS1688	RTC Chip, 28-pin DIP
DS1688S	RTC Chip, 28-pin SOIC
DS1691	RTC Module; 28-pin DIP

### PIN ASSIGNMENT

DS1688 28-PIN DIP  
(600 MIL)DS1688S 28-PIN SOIC  
(330 MIL)

DS1691 28-PIN ENCAPSULATED PACKAGE (740 MIL)

### PIN DESCRIPTION

X1	— Crystal Input
X2	— Crystal Output
RCLR	— RAM Clear Input
AD0-AD7	— Mux'ed Address/Data Bus
PWR	— Power-on Interrupt Output
KS	— Kickstart Input
CS	— RTC Chip Select Input
ALE	— RTC Address Strobe
WR	— RTC Write Data Strobe
RD	— RTC Read Data Strobe
V <sub>CCO</sub>	— RAM Power Supply Output

**DALLAS**  
SEMICONDUCTOR

## DS1689/DS1693 3-Volt/5-Volt Serialized Real Time Clock with NV RAM Control

### FEATURES

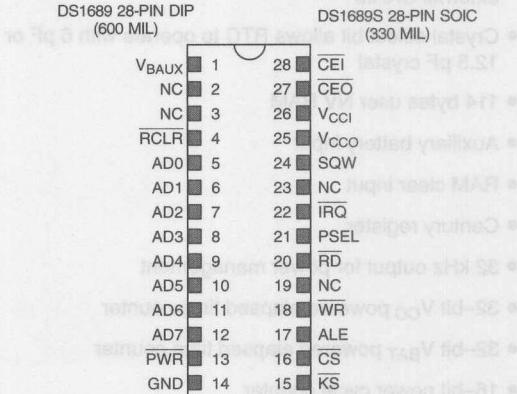
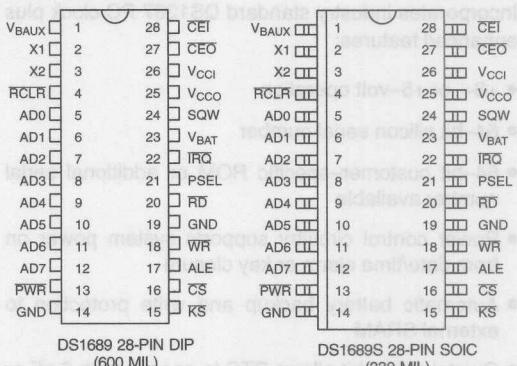
Incorporates industry standard DS1287 PC clock plus enhanced features:

- +3- or +5-volt operation
- 64-bit silicon serial number
- 64-bit customer-specific ROM or additional serial number available
- Power control circuitry supports system power on from date/time alarm or key closure
- Automatic battery backup and write protection to external SRAM
- Crystal select bit allows RTC to operate with 6 pF or 12.5 pF crystal
- 114 bytes user NV RAM
- Auxiliary battery input
- RAM clear input
- Century register
- 32 kHz output for power management
- 32-bit V<sub>CC</sub> powered elapsed time counter
- 32-bit V<sub>BAT</sub> powered elapsed time counter
- 16-bit power cycle counter
- Compatible with existing BIOS for original DS1287 functions
- Available as chip (DS1689) or stand-alone module with embedded battery and crystal (DS1693)
- Chips are available in industrial temperature version
- Timekeeping algorithm includes leap year compensation valid up to 2100

### ORDERING INFORMATION

PART #	DESCRIPTION
DS1689	RTC Chip, 28-pin DIP
DS1693S	RTC Chip, 28-pin SOIC
DS1693	RTC Module; 28-pin DIP

### PIN ASSIGNMENT



### PIN DESCRIPTION

- X1 — Crystal Input
- X2 — Crystal Output
- RCLR — RAM Clear Input
- AD0-AD7 — Mux'ed Address/Data Bus
- PWR — Power-on Interrupt Output (open drain)
- KS — Kickstart Input
- CS — RTC Chip Select Input
- ALE — RTC Address Strobe
- WR — RTC Write Data Strobe
- RD — RTC Read Data Strobe
- V<sub>CCO</sub> — RAM Power Supply Output

**DALLAS**  
SEMICONDUCTOR

## DS17285/DS17287

### 3-Volt/5-Volt Real Time Clock

#### FEATURES

Incorporates industry standard DS1287 PC clock plus enhanced features:

- +3- or +5-volt operation
- SMI recovery stack
- 64-bit silicon serial number
- Power control circuitry supports system power on from date/time alarm or key closure
- 32 kHz output on power-up
- Crystal select bit allows RTC to operate with 6 pF or 12.5 pF crystal
- 114 bytes user NV RAM
- 2K bytes of additional NV RAM
- Auxiliary battery input
- RAM clear input
- Century register
- Date alarm register
- Compatible with existing BIOS for original DS1287 functions
- Available as chip (DS17285) or stand-alone module with embedded battery and crystal (DS17287)
- Timekeeping algorithm includes leap year compensation valid up to 2100

#### ORDERING INFORMATION

PART #	DESCRIPTION
DS17285-X	RTC Chip; 24-pin DIP
DS17285S-X	RTC Chip; 24-pin SOIC
DS17285E-X	RTC Chip; 28-pin TSOP
DS17287-X	RTC Module; 24-pin DIP



- 3 +3-volt device
- 5 +5-volt device

#### PIN ASSIGNMENT

DS17285 24-PIN DIP  
DS17285S 24-PIN SOIC

PWR	1	24	V <sub>CC</sub>
X1	2	23	SQW
X2	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	V <sub>BAT</sub>
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	GND
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS17287 24-PIN ENCAPSULATED PACKAGE

PWR	1	24	V <sub>CC</sub>
NC	2	23	SQW
NC	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	NC
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	NC
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS17285E 28-PIN TSOP

IRQ	1	28	KS
V <sub>BAT</sub>	2	27	RD
RCLR	3	26	GND
V <sub>BAUX</sub>	4	25	WR
SQW	5	24	ALE
V <sub>CC</sub>	6	23	CS
PWR	8	22	GND
X1	9	21	GND
X2	10	20	AD7
NC	11	19	AD6
AD0	12	18	NC
AD1	13	17	AD5
AD2	14	16	AD4
		15	AD3

**DALLAS**  
SEMICONDUCTOR

**DS1742**  
Y2KC Nonvolatile Timekeeping RAM

## FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the eight top RAM locations.
- Century byte register
- Totally nonvolatile with over 10 years of operation in the absence of power
- BCD coded century, year, month, date, day, hours, minutes, and seconds with automatic leap year compensation valid up to the year 2100
- Battery voltage level indicator flag
- Power-fail write protection allows for  $\pm 10\%$  V<sub>CC</sub> power supply tolerance
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- Standard JEDEC bytewide 2K x 8 static RAM pinout
- Quartz accuracy  $\pm 1$  minute a month @ 25°C, factory calibrated

## ORDERING INFORMATION

DS1742-XXX (5 Volt)

→ -70 70 ns access  
-100 100 ns access

DS1742W-XXX (3.3 Volt)

→ -120 120 ns access  
-150 150 ns access

## DESCRIPTION

The DS1742 is a full function, year 2000 compliant (Y2KC), real-time clock/calendar (RTC) and 2K x 8 non-volatile static RAM. User access to all registers within the DS1742 is accomplished with a bytewide interface as shown in Figure 1. The Real Time Clock (RTC) information and control bits reside in the eight uppermost RAM locations. The RTC registers contain century, year, month, date, day, hours, minutes, and seconds data in 24 hour BCD format. Corrections for the day of the month and leap year are made automatically.

## PIN ASSIGNMENT

A7	1	24	V <sub>CC</sub>
A6	2	23	A8
A5	3	22	A9
A4	4	21	WE
A3	5	20	OE
A2	6	19	A10
A1	7	18	CE
A0	8	17	DQ7
DQ0	9	16	DQ6
DQ1	10	15	DQ5
DQ2	11	14	DQ4
GND	12	13	DQ3

## PIN DESCRIPTION

A0-A10	— Address Inputs
CE	— Chip Enable
OE	— Output Enable
WE	— Write Enable
V <sub>CC</sub>	— Power Supply Input
GND	— Ground
DQ0-DQ7	— Data Input/Outputs

The RTC clock registers are double buffered to avoid access of incorrect data that can occur during clock update cycles. The double buffered system also prevents time loss as the timekeeping countdown continues unabated by access to time register data. The DS1742 also contains its own power-fail circuitry which deselects the device when the V<sub>CC</sub> supply is in an out of tolerance condition. This feature prevents loss of data from unpredictable system operation brought on by low V<sub>CC</sub> as errant access and update cycles are avoided.

**DALLAS**  
SEMICONDUCTOR

# DS1743/DS1743P

## Y2KC Nonvolatile Timekeeping RAM

### FEATURES

- Integrated NV SRAM, real time clock, crystal, power-fail control circuit and lithium energy source
- Clock registers are accessed identical to the static RAM. These registers are resident in the eight top RAM locations.
- Century byte register
- Totally nonvolatile with over 10 years of operation in the absence of power
- BCD coded century, year, month, date, day, hours, minutes, and seconds with automatic leap year compensation valid up to the year 2100
- Battery voltage level indicator flag
- Power-fail write protection allows for  $\pm 10\%$  V<sub>CC</sub> power supply tolerance
- Lithium energy source is electrically disconnected to retain freshness until power is applied for the first time
- DIP Module only
  - Standard JEDEC Byte-wide 8K x 8 static RAM pinout
- PowerCap Module Board only
  - Surface mountable package for direct connection to PowerCap containing battery and crystal
  - Replaceable battery (PowerCap)
  - Power-On Reset Output
  - Pin for pin compatible with other densities of DS174XP Timekeeping RAM

### ORDERING INFORMATION

DS1743P-XXX (5 Volt)

- -70 70 ns access
- -100 100 ns access
- blank 28-pin DIP Module
- P 34-pin PowerCap Module board\*

DS1743WP-XXX (3.3 Volt)

- -120 120 ns access
- -150 150 ns access
- blank 28-pin DIP Module
- P 34-pin PowerCap Module board\*

\*DS9034PCX (PowerCap) Required:  
(must be ordered separately)

### PIN ASSIGNMENT

NC	1	28	VCC
A12	2	27	WE
A7	3	26	CE2
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

28-PIN ENCAPSULATED PACKAGE  
(700 MIL EXTENDED)

NC	1	34	NC
NC	2	33	NC
NC	3	32	NC
RST	4	31	NC
V <sub>CC</sub>	5	30	A12
WE	6	29	A11
OE	7	28	A10
CE	8	27	A9
DQ7	9	26	A8
DQ6	10	25	A7
DQ5	11	24	A6
DQ4	12	23	A5
DQ3	13	22	A4
DQ2	14	21	A3
DQ1	15	20	A2
DQ0	16	19	A1
GND	17	18	A0
	X1	GND	V <sub>BAT</sub>
			X2

34-PIN POWERCAP MODULE BOARD  
(USES DS9034PCX POWERCAP)

### PIN DESCRIPTION

A0-A12	- Address Input
CE	- Chip Enable
CE2	- Chip Enable 2 (DIP Module only)
OE	- Output Enable
WE	- Write Enable
V <sub>CC</sub>	- Power Supply Input
GND	- Ground
DQ0-DQ7	- Data Input/Output
NC	- No Connection
RST	- Power-on Reset Output(PowerCap Module board only)
X1, X2	- Crystal Connection
V <sub>BAT</sub>	- Battery Connection

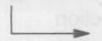
### FEATURES

Incorporates industry standard DS1287 PC clock plus enhanced features:

- Y2K-compliant
- +3- or +5-volt operation
- SMI recovery stack
- 64-bit silicon serial number
- Power control circuitry supports system power on from date/time alarm or key closure
- 32 kHz output on power-up
- Crystal select bit allows RTC to operate with 6 pF or 12.5 pF crystal
- 114 bytes user NV RAM
- Auxiliary battery input
- 4K bytes additional NV RAM
- RAM clear input
- Century register
- Date alarm register
- Compatible with existing BIOS for original DS1287 functions
- Available as chip (DS17485) or stand-alone module with embedded battery and crystal (DS17487)
- Timekeeping algorithm includes leap year compensation valid up to 2100

### ORDERING INFORMATION

PART #	DESCRIPTION
DS17485-X	RTC Chip; 24-pin DIP
DS17485S-X	RTC Chip; 24-pin SOIC
DS17485E-X	RTC Chip; 28-pin TSOP
DS17487-X	RTC Module; 24-pin DIP



- 3 +3-volt device
- 5 +5-volt device

### PIN ASSIGNMENT

PWR	1	24	V <sub>CC</sub>
X1	2	23	SQW
X2	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	V <sub>BAT</sub>
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	GND
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS17485 24-PIN DIP  
DS17485S 24-PIN SOIC

PWR	1	24	V <sub>CC</sub>
NC	2	23	SQW
NC	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	NC
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	NC
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS17487 24-PIN ENCAPSULATED PACKAGE

IRQ	1	28	KS
V <sub>BAT</sub>	2	27	RD
RCLR	3	26	GND
SQW	4	25	WR
V <sub>CC</sub>	5	24	ALE
V <sub>CC</sub>	6	23	CS
PWR	7	22	GND
X1	8	21	RD
X2	9	20	AD7
NC	10	19	AD6
AD0	11	18	NC
AD1	12	17	AD5
AD2	13	16	AD4
	14	15	AD3

DS17485E 28-PIN TSOP

**DALLAS**  
SEMICONDUCTOR

## DS17885/DS17887 3-Volt/5-Volt Real Time Clock

### FEATURES

Incorporates industry standard DS1287 PC clock plus enhanced features:

- Y2K-compliant
- +3- or +5-volt operation
- SMI recovery stack
- 64-bit silicon serial number
- Power control circuitry supports system power on from date/time alarm or key closure
- 32 kHz output on power-up
- Crystal select bit allows RTC to operate with 6 pF or 12.5 pF crystal
- 114 bytes user NV RAM
- Auxiliary battery input
- 8K bytes additional NV RAM
- RAM clear input
- Century register
- Date alarm register
- Compatible with existing BIOS for original DS1287 functions
- Available as chip (DS17885) or stand-alone module with embedded battery and crystal (DS17887)
- Timekeeping algorithm includes leap year compensation valid up to 2100

### ORDERING INFORMATION

PART #	DESCRIPTION
DS17885-X	RTC Chip; 24-pin DIP
DS17885E-X	RTC Chip; 28-pin TSOP
DS17885S-X	RTC Chip; 24-pin SOIC
DS17887-X	RTC Module; 24-pin DIP

→ -3 +3-volt device  
→ -5 +5-volt device

### PIN ASSIGNMENT

PWR	1	24	V <sub>CC</sub>
X1	2	23	SQW
X2	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	V <sub>BAT</sub>
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	GND
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS17885 24-PIN DIP  
DS17885S 24-PIN SOIC

PWR	1	24	V <sub>CC</sub>
NC	2	23	SQW
NC	3	22	V <sub>BAUX</sub>
AD0	4	21	RCLR
AD1	5	20	NC
AD2	6	19	IRQ
AD3	7	18	KS
AD4	8	17	RD
AD5	9	16	NC
AD6	10	15	WR
AD7	11	14	ALE
GND	12	13	CS

DS17887 24-PIN ENCAPSULATED PACKAGE

IRQ	1	28	KS
V <sub>BAT</sub>	2	27	RD
V <sub>CC</sub>	3	26	ND
SQW	4	25	WR
V <sub>CC</sub>	5	24	ALE
V <sub>CC</sub>	6	23	CS
PWR	8	22	GND
X1	9	21	MS in Dallas Semiconductor Module
X2	10	20	AD7
NC	11	19	AD6
AD0	12	18	NC
AD1	13	17	AD5
AD2	14	16	AD4
		15	AD3

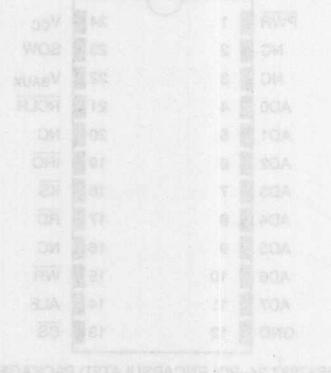
DS17885E 28-PIN TSOP

# DALLAS SEMICONDUCTOR

## DS9034PCX PowerCap with Crystal

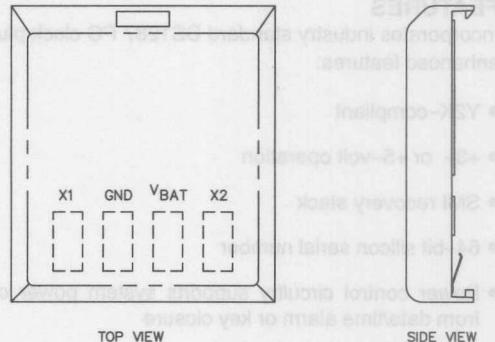
### FEATURES

- Provides 10 years of battery backup power for Non-volatile Timekeeping RAMs in the PowerCap Module package (PCM)
- Snaps directly onto surface-mounted PowerCap Module Boards
- Detachment feature allows easy removal
- Compatible with these 34-pin PowerCap Modules:
  - DS1644P-xxx
  - DS1646P-xxx
  - DS1647P-xxx



### DESCRIPTION

The DS9034PCX PowerCap is designed to be a snap-on lithium power source for Nonvolatile Timekeeping RAMs in Dallas Semiconductor's directly surface-mountable PowerCap Module (PCM) package. After a PowerCap Module Board has been soldered in place and cleaned, the DS9034PCX PowerCap is snapped on top of the PCM Board to form a complete PowerCap Module package. The PowerCap is keyed to prevent incorrect attachment. The DS9034PCX can be easily removed by inserting a regular screwdriver into a detachment feature and prying gently outward and upward to release the PowerCap from the PowerCap Module Board.



### PIN DESCRIPTION

V <sub>BAT</sub>	+3 Volt Battery Output
GND	Ground
X1, X2	32.768 kHz Crystal Connections

### ABSOLUTE MAXIMUM RATINGS\*

Operating Temperature	0°C to 70°C
Storage Temperature	-20°C to +70°C

### CRYSTAL CHARACTERISTICS

Nominal Frequency	32.768 kHz
Load Capacitance	6 pF

### BATTERY CHARACTERISTICS

Nominal Voltage	3V
Nominal Capacity	130 mAh
Chemistry	Li (CF)x
Data Retention Life	10 Years (25°C)

\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.